THE

# ELECTRICAL REVIEW.

VOL. LXII. · FEBRUARY 28, 1908. · No. 1,579.

## ELECTRICAL REVIEW.

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THE ELECTRICAL REVIEW.

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Telephone Nos. Holborn 933 Central 4425 (Editorial only).

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Cheques and Postal Orders (on Chief Office, London), to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

**READY!**

**THE**

**UNIVERSAL ELECTRICAL DIRECTORY**

**(J. A. BERLY'S).**

**1908 EDITION**

**H. ALABASTER, GATEHOUSE & CO.,**

**4, Ludgate Hill, London, E.C.**

## ELECTRICITY IN AUSTRALIAN COAL MINES.

IN our leading article for February 7th we referred to the trouble experienced in connection with the coal-cutting machinery in some of the collieries in New South Wales, and to the report of the Committee formed to investigate the complaints. Some further details of the final report are now to hand, and it may be of interest to give a few particulars not previously noticed. Generally the investigation and report is on all fours with that of the Home Office Commission appointed in 1904 to inquire into the question of electricity in mines in our own country, except that the former Committee had all the advantages of the last-named report to guide it.

It appears that there are 33 collieries in New South Wales, equipped with electric generating plant, and all with one exception are direct current; 25 of them have what is classed in this country under the new rules as low pressure, and seven medium pressure. The exception is equipped with high-pressure three-phase plant, which was adopted on account of the extent of the workings throughout which it was intended to use electricity. The total capacity amounts to 2,176 KW., or 2,917 H.P. There are 1,482 electric lamps on the surface and 777 underground. Of motor-driven machinery 16 collieries have 62 coal-cutters; six have eight haulage gears; 19 have 33 pumps; six have 10 ventilating fans, and five have seven motors applied to other purposes; and there appears to be no doubt that the popularity of electricity for power purposes is rapidly extending.

The Committee describes in some detail the experiments made in the Ultimo power house, and expresses the opinion that for the portable motors in connection with the operation of which shocks are most likely to be received, low pressure should be used where possible, regarding it as satisfactory that out of the 16 using coal-cutters, 13 employ low pressure on the motors. The most probable causes of shocks are given as (1) leakage, rendering machine bases, covers, or cable armouring "alive," so that any persons touching them receive shocks; and (2) leaving "live" parts exposed where they are accessible to persons unacquainted with electrical risks.

One of the most frequent causes of shocks from leakage is the lack of proper testing and repair of the trailing cables, in consequence of which the armouring, or the moist outer covering, becomes "alive," and the men whose duty it is to handle these cables receive shocks. In one mine this was so entirely disregarded that a trailing cable actually in use, during the Committee's visit, had the insulation and covering so much broken that the bare conductor was easily visible. Hence the rules criticised in our article above-mentioned. Shocks from "live" metal intentionally left exposed are most frequent in connection with low-pressure systems, owing to the exaggerated idea of the harmlessness of the

shock. Switches with their conducting parts entirely exposed were found in main roadways, and in the travelling roads of one naked-light mine the Committee saw considerable lengths of cable from which the covering had entirely rotted off, leaving the "bare" live conductor in a position and at such a height that the employés were quite likely to come in contact with it. The Committee also adds that it found a disinclination in some quarters to admit the necessity for guarding bare metal carrying low pressure, and —exactly the same as our own Committee found—the tendency to practical joking with that pressure had unfortunately been in evidence more than once. The Committee also refers to the possible cause of fires by overheating of a conductor, leakage and arcing.

With regard to the rules to render the use of electricity safe, the Committee states that it gave very extended consideration to the question as to the course that should be adopted in the case of high-pressure currents in mines in which safety lamps are used. The draft departmental rules omit any special mention of the point, which is understood to be the Continental and American practice, and implies that the rule relating to this in our own special code is open to doubt. We question this, however, as in our opinion it is quite clear; it reads as follows:—Section (1) General:—(4) "No higher pressure than a medium pressure shall be used in any place or part of a mine to which General Rule No. 8 of the Coal Mines Regulation Act 1887 applies."

General Rule No. 8 relates to the use of safety lamps, and in collieries where only safety lamps are allowed, it is evident that no higher pressure than "medium" can be taken down. It is no doubt a vexatious kind of rule, and there is no reason to think otherwise than that high-pressure three-phase current can be taken even into a fiery mine, and, simply because it is high pressure, which demands care and attention with regard to the insulation resistance, may be even safer than low pressure. A great deal depends upon the condition of the mine itself, and a great deal more upon the quality of the apparatus and cables, which ought to be selected with a judgment based on underground experience. What is suitable for one mine may be quite inapplicable to another. A majority of the Committee appears to have been in favour of leaving this question open, as well as that relating to the placing of conductors in the return air-ways of fiery mines, but there are other reasons why they should not be so placed, chiefly because the air is more or less moist, and attacks the cable covering, especially that of the negative in the case of direct current. One member, however, could not agree with the Committee on either point, his fear with regard to the high-pressure current being that through misadventure or accident, the insulation of the transformers might break down, and the current thus find its way into the "secondary" conductors, the consequent fusing of which would lead to a condition of danger. He might as well have objected to the use of compressed air on the ground that a fire might occur in the receiver which would give rise to poisonous gases, and so lead to a condition of danger, a state of affairs which is not quite so uncommon as may be supposed. Wherever, and whatever kind of power be employed, there is always the likelihood of a condition of danger being created, which can only be guarded against by a common-sense use of knowledge gained during a thorough training in that particular branch of engineering to which the power applied belongs. Electricity is no exception to the rule, but with proper skill and attention to its installation and working, it is as safe as, and much more efficient than, any other form of power transmission known. As to the rules themselves, we have already said enough, but it may be noted that they include numerous departures from the British rules, mainly in "precision of detail, as the Committee's investigations had furnished ample evidence that definiteness in the rules is essential to the prevention of bad work." But it is just here that they will fail, as they have to a great extent failed in this country, and no set of rules and regulations can make a good platelayer into a competent engine driver. As we write we have before us a report of an inquest upon another poor man killed at Ashington Colliery in Northumberland, who took hold of the "haulage" rope, and as in exactly similar cases that we have previously dealt with, the electrician in charge could find no fault. To say the least, such statements ought not to be made, and in conclusion we might ask, what have the rules done to prevent either the accidents occurring or statements of this kind being put forward?

---

**Auxiliary Machinery in Central Stations.**

Considerable prominence has been given recently to the question of the sphere of the mechanical engineer in central stations, and it may, therefore, be opportune to point out that in some cases the engineers-in-charge are very liable to neglect their auxiliary plant. This is not intended as a reflection upon their training and experience, or on the discharge of their duties, but simply to remind them that they may very easily overlook little points which make a good deal of difference to their work.

The central-station engineer nowadays is so full of facts and figures concerning his main generating sets, knowing, as he does, the losses in his alternators down to a small percentage on every load, that he is rather apt to concentrate his attention unduly upon the economical working of the main units. A good deal of this is due to the fact that central-station people imagine that they are getting machinery at the present time which closely approximates to automatic operation, and are, therefore, tempted to cut down their staff below the limit which is required for the proper management of small details.

We fancy we may be touching a sympathetic chord in more than one reader's memory when we ask whether steam auxiliaries, such as pumps for the feed supply, have not sometimes been run until they would not run any longer, and on their being overhauled, broken piston rings, fractured plunger rings, or damaged foot-valves have been discovered. What this means in loss of economy to the station can only be conjectured, but it is quite evident that an auxiliary apparatus of this description can, if not well looked after, become nothing less than a "steam eater." Its effect in practice has been that in many stations motor-driven auxiliary plant has been installed wherever possible. As a matter of fact, an engineer-in-charge will find it difficult to give too much attention to the running of his auxiliary plant. It is one of the main causes of light-load losses in the station, and he is tackling a very important factor in economy when he can increase the all-round efficiency of the auxiliary plant.

## SMALL POWER STEAM TURBINE INSTALLATIONS.

Whilst steam turbines in large units are technically and economically equal to, or even better than, the latest types of reciprocating engines, the unavoidable steam losses become very important in small turbines, so much so that the latter cannot compete successfully with reciprocating engines on consumption. In reaction turbines, the small depth of blade required with small outputs makes the clearance space between fixed and rotating parts bear an excessive proportion to the actual volume of steam used. Besides the steam wasted in this way, there is, in the case of the Parsons turbine, which is the chief example of this type, the additional waste in the thrust-bearing. In the case of impulse turbines, the higher peripheral and steam speeds used enable a smaller number of wheels to be employed. The friction losses, which increase with the square of the steam velocity, are, however, of great importance here, especially in small units. The considerable popularity of small turbine sets, in spite of these defects, indicates their great applicability in other respects, especially for dynamo driving.

For the lighting of ships, for instance, for which small high-speed reciprocating engines have been so much used hitherto, the turbine sets are now being introduced on account

| | | | | | |
|---|---|---|---|---|---|
| KW. output ... ... ... | 44·4 | 53·0 | 66·3 | 144·2 | 152·5 |
| Speed ... ... ... ... | 3,600 | 3,600 | 3,000 | 3,000 | 3,030 |
| Steam pressure, lb. per sq. in. | 160 | 125 | 117 | 74 | 95 |
| Steam temperature, °C. ... | 261 | 249 | 211 | 196 | 256 |
| Vacuum, per cent. ... ... | 80 | 80·5 | 87·6 | 92·7 | 90·8 |
| Steam consumption in lb. per KW.-hour. ... ... ... | 30 | 29·2 | 28·8 | 25·3 | 23·2 |

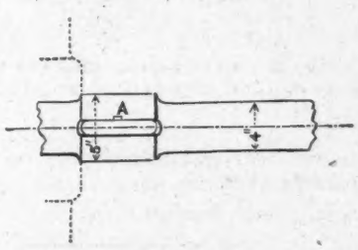
—*Zeitschrift für das gesamte Turbinewesen.*

## CORRESPONDENCE.

***Letters received by us after 5 p.m. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.***

### Breakage of Car Axles.

With reference to Mr. Acland's letter in your last issue, permit me to say that for over a year I have been making our new axles with the seat for the gear wheel 5 in. diameter, the normal section of the axle being 4 in. I have not, however, had these in use long enough to say whether the increase in strength will prevent breakage. Our old axles were 4 in. diameter, made of good steel to a stringent specification, and yet I have had a number of breakages. Here, however, the conditions of service are very severe, owing to the number of curves of short radius. Possibly the reason why Mr. Acland has, so far, not experienced breakages is that curves are not so sharp and numerous on his system.




Ipswich Corporation Tramways.—Portion of Axle, showing Gear-wheel Seat.

I enclose a sketch of that portion of our new axles forming the seating for the gear wheel. In order to facilitate the key-way being machined out on a shaper, I cut it right through the swelled portion of the axle and locate the key by a grub screw in the side of the latter, as shown at A. The head of the grub screw lies in a notch cut for the purpose in the side of the key-way. I find this method both cheap and efficient.

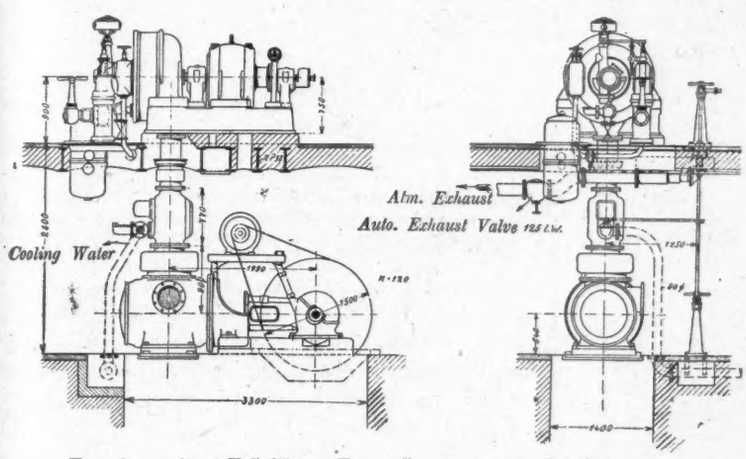
I have been recommended by one firm of steel makers to use 3 to 5 per cent. nickel steel for axles. I understand that, in the rough, these cost some 10s. apiece more than ordinary steel. It would be interesting to learn if the use of this steel has cured the breakage trouble on any tramway system.

**Frank Ayton.**

Ipswich, *February 22nd*, 1908.

### Tangential Suspension of Trolley Wires.

I was pleased to read your articles on the above subject, but in my opinion a better method of suspending the trolley wires than on the porcelain reel—especially on existing




Figs. 1 and 2.—A.E.G. 75-kw. Turbo-Generator and Jet Condenser.

both of the reduced space used and the reduced care and attention required.

In figs. 1 and 2 the complete installation of a 75-kw. turbo-generator by the A.E.G. is shown. This company builds turbines of from 30 h.p. to 6,000 h.p. capacity, and for all, the installation is carried out on similar lines. For the smallest sets a single-pressure stage is used with a triple crown of blades, whilst for the larger sets two-pressure stages are used with one or two speed stages. The space occupied, owing to the high peripheral speeds used, is very small, and the foundations, which have practically only to support the dead weight, are, as a rule, of light girder construction. The exhaust steam is drawn directly into the condensing chamber below, and the condensing water jet is regulated by a cock or by gearing from the engine-room floor. An automatic valve is arranged to allow of atmospheric exhaust in case of emergency. The air and circulating pump is combined with the condenser chamber, and is driven by belt from an electric motor. Jet condensation is preferable in the case of small turbine sets, because of the reduced first cost. The vacuum must, however, not be carried too high if the pump is to be kept reasonably small, and, owing to the impurity of the cooling water, it is not usually possible to employ the warm condenser water again as boiler feed. In the somewhat larger sets (150 kw.) separate air and circulating pumps are sometimes employed. Sometimes surface condensers are preferred, and these are usually served by a combined air and circulating pump with belt drive from an electric motor. The following table gives some particulars of test results obtained with the smaller A.E.G. turbine generator sets :—

fittings—would be to use an arrangement similar to the splicing ear anchoring device illustrated by you on June 22nd, 1906, with the exception that the hole in the iron plate would be threaded to receive the insulating bolt. This would anchor the line (a very important matter on a steep hill), and would also obviate the tendency (in the event of a trolley getting wedged in the V and breaking the wire, which looks not unlikely on a curve) of the "live" galvanised wire when reeving through the reel, of whipping up to the arm and shorting the line. It would also prevent the wire chafing at the point of suspension through the continual "wagging" of the trolling wire. I assume it is not intended to use them at a junction where there are pull-offs, frogs, and straight line hangers, as the trolley would have to rise, say, 6 in., in travelling from a straight line hanger to a frog. I fail to see how "wobbling" on a section insulator can be avoided, unless the leads keep them vertical. I am not picking holes in this method of suspension, which I think is an ideal one, given a good suspender on a straight track, it is at the curves where I foresee the difficulties. With reference to Mr. Weatherilt's remarks on the insulating properties of porcelain reels for trolley wire, it may be of interest to him to know they have been in use many years as a secondary insulator in place of the more expensive brooklyn strain with its useless adjusting screw and have given very satisfactory results. I have tested common brown stoneware reels with no cover, and "umbrella" covered insulating bolts, and when the latter were showing 20-100 on the voltmeter, no deflection could be got from the former. This on a damp day in the impure atmosphere of a manufacturing town.

With regard to crystallisation, I have had no trouble with it on grooved trolley wire and mechanical ears, and if wear at the ends of the ears only has to be considered, a section of wire could be moved bodily a few inches or feet in one night by a tower wagon gang using S links on the spans as temporary suspenders, and splicing the wire with a mechanical sleeve within the "legs" of the existing section insulator anchor.

**C. T.**

Leyton, E.

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Your correspondent, Mr. A. Weatherilt, states in your issue of the 14th inst., that in his opinion the above system of suspension is much better from a mechanical than an electrical point of view, and goes on to state that the electrical efficiency in wet weather must be less than with the old system.

The ordinary hanger insulator is certainly designed to have good insulation and give a dry zone, such as your correspondent refers to, but I think, on consideration, it will be admitted that this is not altogether the case in practice.

The insulated bolt, undoubtedly, as time goes on, gets coated with a skin of foreign matter which reduces its insulating properties. Mr. R. N. Tweedy, who has gone fully into this matter, has shown how wet, grease, and metal dust are thrown up from the trolley wheel on to these insulating bolts, so that a dry zone, which would undoubtedly be present in any other form of hooded insulator, does not exist in tramway work.

It is well known also that a deteriorating action occurs on these insulated bolts, due to electrolytic corrosion of the steel bolts, which in time disintegrates the insulation.

Mr. Weatherilt concludes that the porcelain reel insulators, which I have introduced for both the primary and secondary insulation on tramway overhead work, will give every satisfaction in clear and dry atmosphere, but questions whether this would be so in wet weather.

Their efficiency does undoubtedly fall off slightly in wet weather; but as the efficiency is of such a high order, I think it will be readily admitted that their use can be considered thoroughly satisfactory.

On the Derby Corporation extensions there are nearly 3 miles of the tangential suspension system in use, and Mr. Wilmshurst has been good enough to give me some figures, which show that both in fine, foggy and wet weather the leakage current on the sections where the tangential suspension system is installed is equally as good, and in many cases better, than on the other sections equipped with the ordinary type of hanger insulator.

I have had 50 pairs of these insulators connected up so that they are under very similar conditions to that which exist in practice, and these have been exposed to the weather, together with the dust and dirt inseparable from the adjoining electricity station and gasworks, for nearly 18 months. A test was taken on Saturday last during one of the very heavy gales which were prevalent throughout the country, and I give the records below :—

TESTS ON 50 PAIRS OF TANGENTIAL SUSPENSION INSULATORS AT 500 VOLTS CONTINUOUS CURRENT.

| Time. | Weather. | Leakage current. |
|---|---|---|
| 7.8 p.m. | Fine rain just commencing. | Insulation approximately infinity. |
| 7.10 „ | Heavy rain. | ·002 ampere. |
| 7.12 „ | Very heavy rain. | ·005 „ |
| 7.13 „ | Heavy rain. | ·002 „ |
| 7.14 „ | Light rain. | ·0015 „ |
| 7.16 „ | Drizzle. | ·0015 „ |
| 7.18 „ | Drizzle. | ·0015 „ |
| 7.20 „ | Fine rain. | ·001 „ |
| 7.25 „ | Rain stopped. | ·0005 „ |
| 7.30 „ | Rain stopped. | Insulation approximately infinity. |

These tests show that under very heavy rain accompanied by a violent hurricane, the leakage current on 50 pairs of insulators, which are equivalent to a little more than ½ mile of double trolley wire, does not exceed 5 milli-amperes, notwithstanding that there is no dry zone, and the whole of their surface is exposed to the weather. It is interesting to see how rapidly the insulation rose when the rain moderated, and that 18 minutes after the storm was at its height, the insulation was approximately infinity.

A throw on the milli-ampere gauge used would be less than $\frac{1}{10}$ milli-ampere, and where the insulation is given as approximately infinity, no throw on the gauge was recorded.

Some tests on these same insulators at 2,000 volts alternating, might also be interesting to your correspondent as showing that the insulators have a big factor of safety as regards voltage, coupled with very severe weather conditions.

TESTS ON 50 PAIRS OF INSULATORS AT 2,000 VOLTS.

| | Weather. | Leakage current. |
|---|---|---|
| Taken over period of about half an hour. | Light rain ... ... ... ... | ·019 |
| | „ „ ... ... ... ... | ·019 |
| | Very heavy rain ... ... ... | ·033 |
| | „ „ „ ... ... ... | ·0437 |
| | Light rain ... ... ... ... | ·0192 |
| | Rain stopped ... ... ... | ·0137 |
| | One hour later ... ... ... | ·006 |

I think, therefore, I can fairly claim that this type of insulator is a distinct advance on the present form of insulation. I am of the opinion that the petticoat form of insulator which introduces, or attempts to do so, a dry zone, is seriously robbed of its supposed advantages owing to the fact that the petticoat in any form of insulator allows smoke, dirt, cob-webs, and other foreign matter to collect, which the weather never has the opportunity of removing. The tests I commenced carrying out 1½ years ago on weather-washed insulators led me to think that this type would be preferable for all voltages, and although the petticoat form of insulator is almost exclusively used for our E.H.T. transmission lines, I am of the opinion that it will be supplanted in time by a simpler and probably cheaper type of insulator, of an entirely weather-washed pattern.

**P. J. Pringle.**

Electricity and Tramway Department,
Burton-on-Trent,
*February 24th*, 1908.

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### Gas-tight Switches.

Mr. Dunlop and your correspondent "Accuracy," in commenting on my article on "Gas-tight Switches" which appeared in your issue of January 31st, raise the point that switches for use in "fiery" mines should be made flame-tight and explosion-proof, and appear to urge this as more important than making the switch gas-tight. While there is no doubt a good deal to be said for this provision as an *extra* precaution, it obviously becomes unnecessary if the switch is so designed that gas cannot get into the box.

Theoretically, it is impossible to make the casing of an air-break switch or fuse, absolutely gas-tight, owing to the fact that the faces of the joint are never in perfect contact and there is always, therefore, a very fine passage between them. Through this passage it is possible for gas to diffuse into or out of the box without any difference of pressure existing between the inside and outside, a difference of density being all that is necessary. The rate at which diffusion will take place will be slower, the finer the passage, *i.e.*, the better the joint.

Supposing such a switch box to be enveloped in a gassy atmosphere, the gas will diffuse through the joint and gradually displace the air in the box, so that if the process continues for a sufficient length of time, the mixture of air and gas will eventually reach a proportion which is ignitable, and if further prolonged the mixture will become explosive. If now the surrounding gas is removed and fresh air takes its place, the process will be reversed and the gas gradually diffuse out of the box, leaving it in its original condition.

Except in very gassy and dangerous mines, the conditions prevailing, especially in the intake air roads where switches and fuses ought to be placed, are such that when gas does appear in any quantity it is carried along by the ventilation, and the period during which a switch box would be enveloped in gas is so short that the diffusion through a good joint would be inappreciable. The switch would thus be for all practical purposes gas-tight, and the construction such that there would be no danger of firing gas, thus fulfilling the requirements of the C.M.R.A. Electricity Rules.

Where the mine is so gassy that switch boxes may be frequently exposed for many hours to an atmosphere heavily charged with gas, the conditions are such that it is very doubtful whether electricity should be installed at all. Even with explosion-proof switches of perfect design there is still the ever-present danger of a cable firing the gas by shorting or leaking.

Except in cases where it is felt that the risk of explosion is sufficiently great to be a matter of anxiety, the extra cost of the explosion-proof switch case, its unwieldiness and great weight, owing to the fact that it must be designed on the lines of a gas engine cylinder, are disadvantages which, in my opinion, to a large extent set off the additional safety obtained. It should be remembered that the positions where gas-tight switches are required are chiefly in the roadways and workings, and that they are usually in connection with coal-cutting, pumping, small haulages, auxiliary fans, or other installations of a temporary nature, so that the switches have from time to time to be removed to new positions. They are often fixed on timbering, which gives way in the course of time, necessitating periodical re-erection of the switch, in addition to which, if the switch requires repairing, it is usually necessary to remove it to the surface. This means, of course, that gas-tight switches may have to be handled a good deal, and the question of weight is therefore one which requires a good deal of consideration.

It is not usual, even in "fiery" mines, to carry on work, especially work which is done by electricians, in an atmosphere of gas, and "Accuracy's" statement that "the case will be filled with an explosive mixture when being fitted up in position (or upon subsequent inspection, perhaps)" presupposes conditions more or less imaginary.

**W. Bolton Shaw.**

Hulton Colliery,
*February 24th*, 1908.

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### The Electrical Manufacturing Position.

Your leading article in the current issue of your paper on the above, states very clearly the condition of affairs at present existing in the electrical manufacturing industry; everyone connected with this side of the business is only too well aware of the unprofitable nature of the work, and the insane cutting of prices which is going on. It is a well-known fact that the prices at which public work is placed at the present time barely cover the cost of production, but, unfortunately, the same remark applies to *any* orders which are obtained where there is any competition whatever. To take an instance, two generators of about 300 KW. each were supplied about five years ago to a certain Corporation, at a price which showed a fair profit, yet to-day one may purchase machines of the same output for about 50-60 per cent. of the price, and this with raw materials not any cheaper and wages higher.

The obvious remedy is for the manufacturers to arrange a standardisation of prices, as was tentatively proposed by certain of them some time ago, but this seems to be impossible at the present, when the energy of each appears to be devoted to filling his shops with work—at a loss if necessary—to keep them going. By the ordinary laws of cause and effect, the quality of the manufactures must deteriorate, and this is exactly what has happened. Designs are cut to the finest possible point, and a little material saved here and there, the result being that the machines have practically no margin (manufacturers will not, of course, admit this).

One would naturally anticipate that the smaller concerns, whose resources are supposed to be somewhat limited, would feel the competition most keenly, but, up to the present, the only mannfacturers who have been compelled to bring their troubles obtrusively before the public have been among the more prominent. This may be accounted for from the fact that the smaller manufacturers are content to have an engineer with a business training at the head of affairs and not a "genius of finance," and that such luxuries as the financing of unprofitable power schemes are fortunately beyond their means.

The lesser lights have certainly been hit hard by the conditions of competition, as is evidenced by the absence of dividends, but, so far, there is no appearance of the "weeding-out process" having begun. Probably when the "gradual extinction of the weaker firms" starts, their stronger (?) brethren will be exhausted by the struggle and unable themselves to continue!

Healthy competition is undoubtedly to be desired, but the present policy of "beggar my neighbour" appears to be suicidal.

Cannot the manufacturers manage to settle their differences and come to some arrangement whereby prices may be maintained to show a working profit? It would surely be for the good of everyone connected with the trade.

**Onlooker.**

Glasgow, *February 24th*, 1908.

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### Price of Tantalum Lamps.

*Re* the above, I quite believe with "Fairplay" that it is time something was done in this matter. Now that Siemens Bros. have issued a "danger signal" (at least I take it as such, seeing that the printer's ink used is red instead of black), I hope that they will act up to the portion of the circular which says: "Lamps are sold to the trade conditionally that they are not resold under 2s. 6d. each net, for Standard lamps, and 3s. 6d. each net, Sun lamp bulbs." The ones which Siemens Bros. will have to watch more particularly, will be large firms who say they can supply anything from "a needle to an anchor" (tantalum lamps being included amongst the articles between the two necessary commodities mentioned). In order to support this statement, I was asked within the last few days to give a price for lighting up a small shop requiring eight tantalum lamps and five ordinary carbon lamps. This particular customer was not sure whether my price should include the tantalum lamps, as he could get them from the firm from whom he got all his goods (furniture, &c.), for 2s. each (*i.e.*, when the lamps were at the retail price of 2s. 9d.). Not only that, but he recommended another customer of mine to get lamps from the same firm at the same price. Another example of underselling is as follows:—One man I know has his factory fitted up with tantalum lamps; he gets his lamps through an ironmonger (with whom he was in partnership some years ago), allowing the ironmonger 5 per cent. on the net price charged by Siemens Bros. I also know quite a number of ironmongers who may have done small wiring jobs at one time, but who get their lamps from Siemens Bros. yet at net prices, even though they have given up the wiring business for some considerable time. If Siemens Bros. were to adopt a policy such that electrical contractors (pure and simple) get these lamps at the lowest

possible cost, and allow ironmongers and large firms, such as the one I have mentioned, only a nominal percentage (say, 2½ per cent.), lamps would be bought through the proper channel, and the manufacturers would not lose anything by it.

**Contractor.**

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**Reviews and Competition Prices.**

I presume it would be useless for me to repeat the appeal I made in another journal for the suppression of anonymity in reviewing. I think, however, that I may fairly ask that the reviewer, like the cobbler, should "stick to his last," and that he should not introduce commercial questions, and what amounts to a distinct encouragement to jerry work, into the review of a technical book. In the review of my book on "Wiring for Plumbers and Gasfitters," your reviewer approves of my condemnation of the looping-in system, but goes on to say that with competition prices the method is necessary. Surely, Sir, electrical work has already too many sins to answer for in the shape of fires, without the encouragement in the columns of the oldest electrical paper, under the guise of a review, of work that everyone is agreed increases the danger of fire.

May I also ask whether reviewers might not with advantage to the industry consider the dignity of their office more? What has a reviewer to do with competition prices when reviewing a technical book? Would the Electrical Review like it to go forth, say if a fire should be traced to the looping-in system, that the method had been recommended in its columns?

**Sydney F. Walker.**

Bath, *February 24th*, 1908.

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**Appointment of Consulting Engineer at Burton-on-Trent.**

I see under the heading of "Lighting and Power Notes" in your last week's issue, it is stated that at Burton-on-Trent, Mr. J. Ferguson Bell, of Derby, has been re-appointed consulting engineer to the Gas and Electricity Committee for 12 months, his agreement to include re-organisation of works.

I should like to state, so as to remove any wrong impression, that this re-appointment solely concerns the gas department, and has no reference whatever to the electricity department.

**P. J. Pringle.**

Electricity and Tramways Department,
Burton-upon-Trent.
*February 24th*, 1908.

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**Economical Arc Lighting.**

The subject of Mr. Hame's letter under the above heading has occupied our closest attention during the last three or four years.

Some of our clients pay for energy alone, for arc lighting, as much as £4,000 per annum, and could such a saving as that suggested by Mr. Hame be applied, it would prove of the utmost value.

After careful investigation and experiment, we have had reluctantly to come to the conclusion that, in the majority of cases, the suggested system of running enclosed and open-type arc lamps in series is undesirable, and in most cases impracticable, except, perhaps, in isolated cases, where the saving does not, in our opinion, merit the increased initial expenditure and the added trouble in attendance. Enclosed lamps are generally used for the following reasons—either because of low ceilings, the saving in attendance (carboning, cleaning, &c.), or where only two lamps are actually required at the same time, or even, in some cases, one lamp, in which case a twin enclosed lamp is used. In neither of these instances can the suggested economy be applied.

Again, the enclosed lamp is "clutch fed," and feeds very infrequently (when the length of arc reaches its maximum, or when an interruption takes place in the circuit), whereas the open-type lamp feeds frequently, and is "brake fed," and at 5 amperes requires carbons of remarkably small diameter, and, therefore, difficult to keep in alignment. Also, the lighting effect at this current is very poor indeed.

By increasing the current to 7 amperes a much better result is obtained, but by so doing you immediately wipe out the efficacy of the whole suggestion, or, in other words, the remedy proves worse than the disease. What we have found to be much more economical and effective when enclosed lamps are used on a voltage of from 220 to 240 is to increase the length of arc and reduce the current to the neighbourhood of 4 amperes—with good carbons the result is satisfactory, and with the increased voltage of the arc the waste in the resistance is largely diminished.

**Duncan Watson & Co.**

London, W., *February 24th*, 1908.

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**Earth Wires in Coal Pits.**

May I mention in reply to "Cymro," that the whole question of "earth" in collieries, was fully dealt with in a paper which I read before the Institution of Mining Engineers, about two years ago. The difficulty is exactly as you point out in your Editorial note, the resistance of the strata. At my suggestion an extensive series of measurements, upon the resistance of the different strata, were carried out at the Durham College of Science, under the direction of Prof. Stroud. The results of these were given in a paper read before the North of England Institute, and I based the paper I read before the Mining Institute, upon them. As you remarked in your note, the question of "earth" in a colliery, and, in fact, in any mine, is an exceedingly difficult one. Probably the safest plan that could be adopted would be to run an "earth" conductor, which might be an old wire rope, from the surface down the shaft, and along the main roads to as near the face as could be arranged, connection being made to it from every switch case, machine carcase, distributor case, &c. This presents some difficulty, but I think would be the safest and most practical solution of the problem.

**Sydney F. Walker.**

Bath, *February 24th*, 1908.

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**The Measurement of Illumination.**

I have been reading with extreme interest the discussion on the above subject in your columns. The points at issue seem to reduce themselves to three in number.

1. Should illumination be measured on a horizontal surface or on one at any other angle?
2. Should the photometer screen be fixed or adjustable at any required angle?
3. Is the flicker or the inclined screen pattern to be preferred for street work?

As to question 1, both electrical engineers and gas engineers seem to be pretty well agreed that measurements should, at any rate, be recorded as illuminations on a horizontal plane, as being the only one which can receive light from all sources irrespective of their positions. It must not be thought that this is by any means a new problem which has lately presented itself, it was thoroughly discussed 15 years ago when Mr. Trotter read his classic paper on "Illumination" before the Institution of Civil Engineers.

Now the question which Mr. Wild and Mr. Harrison appear to be discussing is something quite different, namely, "Should illumination be measured direct, or ought it to be calculated from a measurement of candle-power." Mr. Wild, for example, says: "Suppose the ground is not level, but rises, say, 1 ft. midway between the posts . . . . The 45° screen will be reduced in illumination by 1 per cent. and the horizontal screen by 7½ per cent." Or in other words:—The calculated illumination differs from the true value in this particular case by 1 per cent. and 7½ per cent. respectively; which, being so, is it not better to measure direct the quantity actually required, rather than to try and calculate it from a measurement of some other quantity which is not thus required? Nor is Mr. Wild's hypothetical hill

between the lamp-posts by any means the only—or even the greatest—source of error when attempting to predetermine by calculation the horizontal illumination. A much more serious error is that due to reflection from neighbouring buildings, and so forth. I will not, however, take up your space with a discussion of this point, as I dealt with it at some length in your columns in December last.

For the same reason, although Mr. Wild's figures are of very great interest as showing the limits of accuracy in an ideal case, experience with street measurements shows that the actual horizontal illumination between lamps is always very considerably greater than that calculated in the way he suggests, and that, moreover, only a portion of the illumination on the screen is due to the direct rays which reach it at a very acute angle, a considerable proportion reaching it at a much smaller angle of incidence. In fact, Mr. Wild's 4 per cent. error would probably be reduced to something like 2 per cent.

To the second question there can be no two answers, since whatever angle is decided upon (whether the horizontal of Mr. Trotter and Mr. Roger Smith, the 45° of Mr. Harrison, the "perpendicular to the rays" of Mr. Wild, or the vertical which has been suggested by other writers), the photometer with an adjustable screen enables it to be dealt with.

Mr. Wild raises the question, in this connection, of whether a separate battery does not introduce a great chance of contact errors. I can assure him, as the result of considerable experience with both arrangements, that this is not so. In fact, since the battery must in any case be connected to the lamp by a pair of leads through a switch of some kind, I cannot see that it makes any difference whether it is actually closed up inside the photometer or not. On the other hand, the objection to shutting up a battery inside such a delicate apparatus is obvious, to say nothing of the great convenience of having the cells separate from the instrument itself.

Question 3 must remain largely one of opinion. My own, for what it is worth, is that while for test-room work, the flicker photometer is an instrument of great value, for street work where rapid measurements have to be taken, and where the illuminations dealt with are often extremely small, it is out of place. Mr. Harrison is apparently somewhat doubtful on the point, as he says that he prefers a photometer which can be used either with or without the flicker arrangement.

He says that the test which finally led him to adopt the flicker in his photometer, consisted in "taking 10 men at random" and turning them on to make measurements with both patterns. He found that the readings agreed better amongst themselves with the flicker photometer than with the other, which convinced him of its superiority. If Mr. Harrison proposed to purchase a motor-car and found himself unable to decide between two rival makes, would he take "10 men at random" and determine which car made the best time from, shall we say, Parliament Square to Victoria Station, under the impartial guidance of its death-dealing crew?

**Kenelm Edgcumbe.**

London, *February 24th*, 1908.

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In your issue of February 14th, Mr. Roger T. Smith refers to my suggestion that measurements of illumination should be taken on a vertical plane as well as on a horizontal plane, and gives us some further interesting curves relating to the lighting of Paddington Station. I think, however, that he has given himself unnecessary trouble and unduly complicated his diagram, by taking readings with his vertical screen pointing in four different directions. In street lighting work and even at Paddington Station (when trains are standing at the platforms) only two lamps have any appreciable effect on a photometer screen placed 4 ft. from the ground and in line between two adjacent lamps, and further, as far as the illumination of vertical surfaces is concerned, the man in the street only notices the effect of one of them.

If we could agree to take measurements, firstly, with a horizontal screen, then with a vertical screen pointing in the direction of one lamp and then with a vertical screen pointing in the direction of the other lamp and plot these three curves together, we should have a very fair graphical demonstration of the illuminating value of a particular lighting installation, and one which takes into account the principal values which enable an observer to see whether a street is well lighted or not. Such an observer, if asked to give an opinion on the lighting, would first of all look at the ground to see if obstructions or inequalities of the road are properly defined, and then look along the street to see if higher obstructions and moving objects can be seen sufficiently well. The former observation corresponds to measurements on a horizontal screen and the latter to those on a vertical screen.

A set of curves taken in this way will give a better idea of the value of illumination than any of the others which have been proposed. Measurement on a horizontal plane only, leaves out the important feature to which I have drawn attention. Measurement on a screen at 45° combines the vertical and horizontal readings, but does not give figures for either of them, and what is described as direct measurement gives figures at constantly varying angles which can only be resolved into their component parts by making a separate calculation at each position, whereas with the method I have advocated we can see at once the two sets of values which have the greatest influence on the lighting effect.

**Alan Williams.**

London, E.C., *February 25th*, 1908.

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### Barnes Street Lighting.

I have read your notes on the above. If Mr. Davidson thinks he is going to get an average life of 750 hours out of the present-day tantalum, I am afraid his disappointment will be bitter. I have had some 500 tantalum lamps in use for street lighting for over two years. The first year I obtained an average life of over 750 hours, using 125-volt lamps in series. This last year I thought that by using 130-volt lamps in series I would get a longer life out of the lamps. The average life, however, for the last year has not been 500 hours.

Mr. Davidson could have more safely put the life of the Osram lamps at 1,100 hours. He will find that it does not blacken, whereas the tantalum—as made to-day—blackens worse than a carbon lamp. The tantalum, like the Osram, should only be burnt hanging vertically. If burnt at an angle the filament sags, and the life is shortened. Taking what I have mentioned into consideration, I cannot understand how the tantalum lamp was chosen at Barnes in preference to the Osram.

**A. J. Abraham.**

Electricity Works, Cambuslang,
*February 22nd*, 1908.

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### Meter Charges.

Assuming that a prepayment meter costing, including erection, £4 10s., has a useful life of eight years, and a yield of 7 per cent. is required on the capital expenditure on the same; viewed in the light of an investment, what is the annual cost for interest and depreciation for each prepayment meter on these lines, or, in other words, how many 8-C.P. lamps of a gross revenue of 6s. per year each would it take to pay these charges without deducting anything for works' costs, &c., of current consumed?

**Manager.**

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### Generating Station Engineers.

Your article on the above subject gave me much pleasure, but it was with feelings of regret that I read Mr. Frank Ayton's article, "The Maintenance of Power Station Plant," in which he takes up the cudgels for marine engineers and supplies them with an unsolicited testimonial. I would like to know how it is that only mechanical men can keep works' costs down to a reasonable level. How is it that these marine men whose electrical knowledge is of the slightest are so popular with a few of our station engineers? Their knowledge of the principles of electricity supply is so weak

that they are given a certain amount by engine-room lectures. It would be ludicrous if it wasn't so pitiable.

A Board of Trade Chief's ticket is not such a hard matter to obtain. It only means putting in the requisite amount of time at sea. Any of the students upon leaving the engineering side of a technical college to enter civil engineering in its various branches, could beat nine out of ten ticket men hollow for theoretical knowledge in steam, mechanics, &c., yet cannot obtain their tickets because they have not been to sea. The examination papers would present less trouble to them than their evening preparations.

Why are not locomotive drivers on the railway given tickets? surely they know as much as, if not more on high-speed engine work than, a marine man. I personally served my time in the engine shops of a shipbuilding and engineering company, after having had a technical college training. I met apprentices who were going to sea. Most of them had commenced work after passing, say, standard six at a Board School, had never attended any evening classes, and were ignorant of the most elementary steam and mechanics, to say nothing of a complex subject like electrical engineering. Yet most of them obtained their tickets without difficulty, and are now, of course, in a position to compete with qualified engineers for posts in a supply station—nay, not only to compete, but over-ride on account of their all-inspiring glorious virtues as marine men.

Do the best men go to sea? My opinion, and I have some experience, is "no." The best fitters at their trade are kept on by the engineering works. The others are busy when trade is good, and out of work when trade is bad. In the end they resign themselves to the best of a bad job and go to sea, where at least they have a more constant employment. When trade is good, look at the numbers of sea-going engineers who stop on shore. Perhaps in the good years to come, chief engineers may learn that a knowledge of steam plant and mechanical engineering can be obtained on shore.

**Shore-going.**

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The system of maintenance outlined in Mr. F. Ayton's article in last week's issue will not, in the writer's opinion, commend itself to many station engineers. In this system the entire plant is divided into a number of sections, a different individual being in charge of each section. The ultimate object of such a division is, apparently, to enable the chief to hold responsible one of his assistants for every mishap that occurs, and so permit the chief to "sleep in his bed with a sense of security." It is to be noted, also, that the weekly reports of repairs needed, &c., are not handed to the chief until these repairs have been carried out. Happy chief!

It is claimed that division of responsibility "tends to make the men vie with each other, &c." This is a very doubtful policy, as it is essential that each man's portion shall be for two-thirds of the time (in a three-shift station) in the charge of his rivals; human nature will here be called into play, with results more or less bad according to the conscience of each man.

Passing over this question of "esprit de corps" amongst the charge engineers, it may next be asked why "switchboard" attendants are required in Mr. Ayton's station. What becomes of the poor consumers' volts whilst the first attendant is in the battery room "topping" cells, or whilst the third attendant is in some other part of the station trying to trace a fault in the circuit of the ventilating fan over the chief's desk? Does this tend to "reliability, or continuity of service," which includes the maintenance of a steady voltage?

As to the larger question of having "mechanical men only," there are likely to be other opportunities of discussing this point. It is to be feared, however, that the electrical work done by these mechanical men will be very "mechanical" in its application, so that it would be interesting to know what the "marine engineer working foreman, who acts as charge-engineer" will do when, in the course of his stated duties, he obtains a low insulation test on a machine. He must remember that there are "mechanical men only" running the station—including the station superintendent (should not this latter be called, rather, "boiler superintendent?")—and if the faulty machine is found on night shift, the chief is "sleeping in his bed with a sense of security."

Picture also the poor third charge-engineer, when fresh on the job. He is a marine man, attending lectures on electricity in the engine room (why not in the stokehold or the car-shed? which is quieter) and trying to become familiar with economisers, water purifiers, and perhaps mechanical stokers.

Surely it cannot be contended that such a system can be as efficient either as regards works' costs, or reliability, as one on which are employed, not marine men, with a smattering of electrical knowledge—picked up, after they have come on the job, from engine-room lectures—but trained central station men, with a skilled day staff of fitters and electricians.

**E. A. P.**

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I have often enjoyed reading your editorial comments, for they are evidently from the pen of a very able writer on matters both electrical and mechanical, and so I confess I was very much surprised when reading your remarks in the last issue calling attention to the opinion expressed by your contemporary—the *Engineer*—that marine engineers should be put in charge of boiler plant in large stations.

You ridicule the idea, and explain that marine engineers are merely educated fitters with, doubtless, a good knowledge of marine boilers and engines, and ask what can they know of mechanical stokers, water-softeners, &c.; and you support your condemnation by saying that station engineers are highly-trained, technical men, who have had long years of experience of boiler-house and engine-room management, and who are in every way better qualified to run a station successfully and economically, than any ex-marine man could be.

Well, it has been my privilege to have worked under *marine chief engineers* who were well-educated men, past-masters in the science of the economical and efficient duty of boilers, and who knew how to keep their engines and auxiliary plant working at their greatest efficiency.

It has also been my experience to have worked under *station engineers* whose only claim to be engineers consisted in their knowledge of mains work, they having had no mechanical or steam experience whatsoever, with the result that I have seen waste going on in both boiler house and engine room simply due to want of practical knowledge on the part of your station engineer, which would never have been tolerated by a good ex-marine engineer.

I think this will be found to be the case in not a few of the smaller stations in this country, but it is not apparent in the larger ones, due to the practical experience and technical training of your "educated fitter" working as station superintendent.

I am afraid your impressions of the marine engineer have been received from the men on small coasting vessels or second-rate tramps, where, certainly, a highly-trained man would be out of place, but surely your remarks are not a little unjust when applied to the man who has gained his experience on one of our modern passenger steamers with all their complication of mechanical and electrical gear?

With apologies for trespassing on your time, but feeling sure I am only expressing the opinions of many of my fellow engineers-in-charge,

**Charge Engineer.**

[Granted that there are exceptions on both sides. We have no wish to disparage marine engineers as a profession, or to claim that there are no "Non-professional Engineers" in charge of electricity works. Our contemporary did not confine its recommendations to the pick of the marine engineers; it exaggerated the importance and significance of the "ticket" to an altogether unjustifiable degree, adopting an attitude with regard to the value of examinations and certificates which was rather academic than practical. If our correspondent will be good enough to read the article which we criticised, we feel sure that, as a practical engineer, he will find himself unable to accept its views on this subject. In a matter of this kind, experience, of the right sort, counts for vastly more than paper qualifications.—Eds. E.R.]

I have read the article by Mr. Ayton with much interest, yet I fail to see the advantages of the so-called system. Under Mr. Ayton's system, as I take it, the whole of the plant runs two-thirds of the year while the man responsible for it is off duty, and not one of the three shift engineers is thoroughly in touch with the whole of the plant which he takes charge of during his shift. The same thing applies to the switchboard attendants. Only one of the three attendants has the maintenance of the board as part of his duties. How these things make for efficiency, I fail to see. Perhaps Mr. Ayton will enlighten me. As regards holding each shift engineer responsible for a third of the plant, I again fail to see the justice of it. Surely Mr. Ayton would not blame the engineer who had the upkeep of the engines, &c., for a breakdown which occurred whilst he was in bed? especially as Mr. Ayton admits, the engines were started up, and shut down, by a greaser.

A. Walsh.

Morecambe, *February 24th*, 1908.

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Copper and Zinc Spinnings.—A correspondent asks for firms who make a speciality of these.

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION.

In September, 1904, an International Electrical Congress was held at St. Louis. Prof. Elihu Thomson was the President and Dr. A. E. Kennelly general secretary of the Congress. Several Governments appointed official representatives, and the Chamber of Government Delegates held its first meeting on September 12th. Col. Crompton read a paper before the Congress, which was very fully discussed, and resulted in the following resolution being adopted by the Chamber of Government Delegates:—

"That steps should be taken to secure the co-operation of the technical societies of the world by the appointment of a representative commission to consider the question of the standardisation of the nomenclature and ratings of electrical apparatus and machinery."

At the close of the meetings of the Chamber of Government Delegates, Col. Crompton was requested to take this matter in hand in conjunction with the President of the American Institute of Electrical Engineers. The English delegates were, in fact, asked to take a prominent part in the endeavour to bring to a successful issue the proposal suggested in the above resolution; and on his return to England Col. Crompton consulted with the leading technical societies in this country with regard to this important matter.

Meetings were held, and the matter was very carefully gone into, with the result that a small executive committee was appointed by the Institution of Electrical Engineers, under the chairmanship of Mr. Alexander Siemens. The object of this committee was to correspond with the technical societies in the various countries and ask them whether, in view of what had taken place at St. Louis, they would be prepared to attend a proposed preliminary meeting, which, it was suggested, might be held in London in June, 1906, during the visit to London of several of the electrical societies which had accepted the invitation of the Institution of Electrical Engineers to visit England as its guests.

This preliminary correspondence naturally stretched over a lengthy period, on account of the difficulty of discovering the right quarters to communicate with, and the necessary explanations which had to be entered into, to say nothing of the actual distance away of some of the correspondents.

With one or two exceptions, the technical societies cordially accepted the invitation, and many showed keen interest in the subject, being in some cases already engaged in working out standards relating to electrical matters in general.

The Executive Committee then proceeded a step further, and drew up a proposed set of rules for the basis of the organisation of the commission, and these rules were circulated beforehand with a view to their being discussed at the preliminary conference. This took place at the Hotel Cecil, London, on June 26th and 27th, 1906; 14 countries were represented, and about 40 delegates were present, Mr. Alexander Siemens being the president. The rules, now awaiting the ratification of the authorities by whom the delegates were appointed, make it clear that the commission can never fall into the hands of any clique; they allow the voice of any electrotechnical committee to be heard and, above all, place every country, large and small, on an equal footing as regards voting power and taxation.

The late Rt. Hon. Lord Kelvin, P.C., O.M., was elected the first president of the commission, and Colonel R. E. Crompton, C.B., was appointed the first honorary secretary, and it is in no small degree due to his energy and tact that the movement is meeting with such success.

Although not mentioned in the report, it was unofficially stated at the preliminary meeting that the annual sum which each country would be asked to give as a subscription towards the expenses of the central office of the Commission, would be £50, and that this figure would not be exceeded.

The British Electrotechnical Committee was appointed soon after the preliminary conference. Electrotechnical Committees have now been formed in Austria, Belgium, Denmark, England, France, Germany, Hungary, Mexico, Spain, Sweden and the U.S.A., and the matter is being considered by Australia, Canada, Italy, Japan, New Zealand, Russia, South Africa and Switzerland, with a view to the appointment of committees.

The Institution of Electrical Engineers has taken great interest in the matter from the commencement, and not only defrayed the preliminary expenses, but also granted a substantial loan towards carrying on the first year's work in order that the Commission might not be hampered financially at the commencement. The success with which the movement is meeting on all sides will, however, obviate the necessity of making great inroads upon the funds placed at the disposal of the honorary secretary.

In order to assist other countries to commence their work, the British Electrotechnical Committee appointed a Sub-committee on Nomenclature under the chairmanship of Mr. A. P. Trotter, the Electrical Adviser to the Board of Trade, which held its first meeting at the end of February, 1907. The sub-committee is engaged in drawing up a list of terms used in the electrical industry with their correct explanations, and has at present considered terms from A to G. When this preliminary list has been agreed upon, it will be circulated fairly widely for further criticism prior to final adoption. After the list has been presented to the British Electrotechnical Committee for approval and adoption, it will be forwarded to the central office for comparison with similar lists of other committees. A Sub-Committee on Symbols has also been appointed, and at this date is in process of formation. Later on a Sub-Committee to deal with the Classification of Electrical Machinery and Apparatus will be appointed, but at the present time it has been thought advisable that the attention of the Committees should, as far as possible, be confined to the question of nomenclature and symbols, which subjects form the basis of the work to be undertaken by the Commission. There is also a movement on foot to perpetuate the name of the late President by giving the name of Kelvin to the kilowatt-hour, and it is probable that at the first meeting of the Council the matter will be discussed with a view to international agreement. It is interesting to note in this connection that the Board of Trade has never employed the term "Board of Trade unit" officially.

A meeting of Council will most likely be held annually, and it is hoped that the first meeting will be held in the autumn of 1908, at which the new President will be formally elected. A meeting of the whole Commission in the ordinary course of events will only be held when a decision on important points cannot be arrived at by correspondence.

The fact that a body of men differing so widely in thought and practice alike, should thus be enabled to meet and, in a friendly spirit of give and take, discuss engineering problems with a view to a general agreement, is another example of the bond of science which is truly international, and the movement should certainly prove no mean factor in promoting the welfare of the Electrical Industry of the world.

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## POST OFFICE ENGINEERS' DINNER.

The fifth annual dinner of the Engineering Department of the Post Office was held at the Grand Hotel, Trafalgar Square, on Tuesday, February 18th, Major O'Meara, C.M.G., R.E., Engineer-in-Chief, presiding.

The guests of the evening included the Right Hon. Sydney Buxton, M.P., Postmaster-General; Mr. Babington Smith, C.B., C.S.I., secretary; Mr. A. F. King; Mr. H. S. Carey; Mr. A. M. J. Ogilvie; Sir John Gavey, C.B.; Sir John Cameron Lamb, C.B., C.M.G.; Hon. R. D. Denman; Lieut.-Col. Price, C.M.G.; Dr. Glazebrook; Dr. Walmsley; Mr. G. Morgan; Mr. A. E. Eames; Mr. J. Kingsbury; Mr. H. Hirst; Mr. J. W. Willmot, and others.

After the royal toasts had been duly honoured, Mr. Sydney Buxton, in proposing the toast of the "Engineering Department," referred to the loss of Lord Kelvin and Mr. Gaine, and to the retirement of Sir John Gavey, who, however, was retained to keep a watching brief over various matters which might occur in the future, perhaps the most serious of which would be the tussle with the National Telephone Co. in 1911. In the engineering department they had two difficulties in the way of carrying out their duties; one was the question of wayleaves, and the other the question of money. On the question of wayleaves, he was endeavouring to pass a Bill through the House of Commons, which would give them greater powers of dealing with the obstruction of individuals. There was another body also with which they had to deal—the Treasury, which was far and away above the Postmaster-General. However, in spite of this they had been able to make considerable strides in the direction of the extension of the telegraph and telephone lines and wires. In the last twelve months no less than 123,000 miles of telegraph or telephone wires were laid. They were having trouble with Chambers of Commerce with

regard to the rates charged for telephones, but the general feeling was that the telephone service ought to be put on a paying basis. He wanted to know when they would be able to use wireless telegraphy for commercial and Post Office purposes. At the present moment it did not seem to be very effective from that point of view; it was far too inaccurate, far too slow; when he saw the advertisements of great feats by Marconi and others, he was sorry to say that so far as his information went they were not as yet so successful as they would like them to be. They already had two Post Office stations at which they were making experiments, and they were about to install two commercial stations, in order to undertake the matter from a Post Office point of view. He would like to congratulate Major O'Meara on the great success which was following the Institution of Post Office Electrical Engineers, which would be of very great advantage to the engineering department as a whole. The number of members was already great, and foreign and Colonial members were asking to join. The engineering department of the Post Office was not only a great credit to the Post Office but also to the nation at large.

Major O'Meara, responding to the toast, expressed regret that Sir William Preece was unable to be present owing to a chill. He referred to the tribute paid to the late Lord Kelvin by five speakers at a memorial service in America. Lord Kelvin was himself a telegraph engineer, and never lost his interest in telegraphy. The announcement that Sir John Gavey was still going to have an active interest in their work must have given them all very great pleasure. The telephone transfer was still the great problem which had to be tackled. The British telegraph service to-day was acknowledged throughout the world to occupy the premier position. In matters telephonic their cousins across the pond were supposed to take the lead; but their engineers had not been content to be simply followers, and there were many devices in use to-day in this country which had been devised by their own engineers. Their work from the earliest days had brought them into contact with individual members of the public, principally in connection with wayleave difficulties. Now to these difficulties were added those anxieties arising from the troubles of the telephone user. They seemed to think that they ought to get the most perfect service at the most trifling cost. There were small grounds for anticipating in the coming year that their engineers would be less busy than in the present. They had a great deal of work to carry out in connection with telephone trunks and telephone exchanges, the completion of the Western underground (by the end of the next financial year they ought to reach the cable landing places near Penzance), and the underground between Newcastle and Leeds. The Postmaster-General had decided to link the old northern route and the new western route, and the first sod had been cut in a length of underground line from Bristol to Worcester. Further work was likely to be authorised in that direction during the next year. If the British Government adhered to the International Radio-Telegraph Convention, new duties and responsibilities would be thrown on the Post Office. By the recent revisions and changes, there had been an increase in the establishment of higher appointments, both on the engineering and clerical sides. There had been a rumour afloat for some time past that a great scheme of devolution was going to be carried out. In 1904 a reorganisation scheme was carried out which had devolution in view to a certain extent. In 1904 they had first-class sections and second-class sections. His recent investigations showed that they could get rid of all the second-class sections. He had expressed confidence in the successful issue of any devolution scheme. The educational work of the Post Office Institution of Electrical Engineers, although it was only in its second session, was already widely recognised, and they were now going to have a journal. He hoped that some day the Institute would pave the way to the foundation of a club where they could meet together, and where not only officers stationed in the provinces might meet those doing duty in London, but also officers might come who had retired from the service.

Mr. Noble, in proposing the toast of "The Visitors," said that they were pleased particularly to have with them the Postmaster-General, as well as Sir John Cameron Lamb, Mr. King, Mr. Carey and Dr. Ogilvie. He referred also to the presence of Sir John Gavey and the regretted absence of Sir William Preece and Mr. S. C. Hooley, who, they hoped would soon be restored to his wonted vigour. He welcomed Mr. Morgan, whose appointment was a most popular and a most fitting one. Lastly, he referred to the secretary, Mr. Babington Smith, whose name was coupled with the toast.

Mr. Babington Smith, in his reply, said the engineering department was the most indispensable part of the machine. They were expected to be diplomatists, filibusters on occasion, and accountants. The accounting work was a very necessary part of an efficient engineering service. In all questions affecting the proper development and conduct of the service, one of the prime necessities was a full, precise, and accurate knowledge of the cost of each operation. Steps were being taking by the engineer-in-chief to provide machinery for arriving at fuller information on these points.

Mr. H. R. Kempe, who was received with loud and prolonged applause, in rising to propose the toast of "The Chairman," said that this was the first occasion upon which Major O'Meara had honoured them in his capacity of engineer-in-chief, and he hoped it would be by no means the last occasion. Major O'Meara had always taken the very greatest interest in matters not only which concerned the department as a great State institution, but also in all matters which concerned the interests of the staff under his command; while he had always shown that firmness which was so necessary in order to control a large department, he had at the same time shown that tactful pliability without which the smooth and harmonious working of the department was quite impossible. Loyalty was both practical, and in its highest aspect sentimental, and he thought in this respect they owed Major O'Meara a debt, for the respect which they felt for him had induced the loyalty which they must all feel towards him.

Major O'Meara, in replying to the toast, said that it was nearly 20 years ago that he first came to the Post Office, and in his career after he left the Post Office, he had felt grateful for the experience he had had there. Six years ago, he was in this country temporarily on leave, and was asked to accept an appointment at the Post Office. He thought they might rely on him to do the best for them all.

# LEGAL.

## True and Variable Electric Lamp Syndicate, Ltd., v. Bryant Trading Syndicate.

On Wednesday, February 19th, in the Chancery Division of the High Court, Mr. Justice Swinfen Eady had before him this case, which was an action for the infringement of two patents of which the plaintiffs were assignees. The action related to the Variable electric lamp, which was a lamp capable of giving two or even more intensities of light by means of two filaments. The lamp was inserted in the ordinary form of socket-holder, and counsel said he was told that it was universally used throughout this country. The great improvement in the commercial value of the lamp was that it had a varying light, and all one had to do was to turn it round in order to obtain this variation which could be either two or three or as much as 16 c.p. His clients were really the assignees, through the intermediary assignees of the inventor, Mr. Quain. He was a professional inventor and a man who had taken out a large number of patents; he invented electric lamps and electric contrivances for illumination. On August 2nd, 1901, he applied for his first patent, and soon after that, on September 17th, he applied for his second patent, No. 18,569, and for all practical purposes the second patent was a very great improvement on the prior specification.

His Lordship: Is the real issue the validity of the patent?

Mr. Edmunds said he did not know exactly. Prior user had been alleged. Their patent really was the working of the special cap in conjunction with the ordinary holder and the ordinary globe. There had been taken out patents for all sorts of variable lamps, but for a very long time none of them came to anything, or at least they had been very little used. There was no switch with the lamp in connection with which there was a dispute. The lamp switched itself merely by turning it. They had put up a considerable number of installations for these lamps. The defendants had been, some little time ago, negotiating for the purchase of the patent lamp, but the negotiations were broken off, and Mr. Harrison, the managing director of the defendant company, subsequently took out a patent which, plaintiffs said, was merely formed to make it identical with the lamp which plaintiffs had.

Mr. Lewis Temple Dickson, an electrician, was called, and said he had heard of the electric lamp called the twist lamp. An illustration was shown to him by defendants' representative. He gave an order for one and sold it to a representative of the Variable Electric Lamp Co. He paid 1s. 4d. for it.

Mr. Quain (inventor of the lamp) gave evidence to show that the first requisite of the variable lamp was that it must be adaptable to the existing holders; it was a standard lamp. The other main requisite was the simplicity of movement. The second patent was more adaptable than the first. They only used lamps made under the second patent. Referring to the Edison & Swan lamp, witness said he did not think it had any sale, and he had never seen one in use.

This was the case for the plaintiffs, and Mr. Terrell, K.C., in opening for the defence, said he did not propose to deal with the first patent. He dealt alone with the second patent and submitted that there was no infringement. There was no invention in Claim 1 within the requirements of the patent law. With regard to Claim 2 it was bad, it was wanting in subject matter and was completely anticipated.

Mr. Charles Bower, an electrical engineer, giving evidence for the defence, said that the device of Hunter & Jack and that of the present patent were practically the same.

The hearing was adjourned.

In giving judgment on Saturday, Mr. Justice Swinfen Eady said the plaintiffs' claim was for infringement of two patents granted in 1901 to John Robert Quain, and now vested in the plaintiffs, or one of them. Both patents related to devices for obtaining different candle-powers in the same incandescent lamp containing two filaments of different resistances by revolving the lamp within the holder. In the former patent, No. 15,689 of 1901, the patentee described a specially designed holder adapted to fit the ordinary sockets in use. This was a ring or tube, the upper end of which was fitted with transverse pins, which fitted into the bayonet joints of the ordinary socket. The lower end of the ring or tube was divided into a considerable number of strips by vertical cuts or slits, the lower ends of which were opened out. A short distance above these lower ends there was formed an annular recess with a corresponding ring projecting outwards, and the cap of the lamp had a corresponding rib or ring projecting round it and fitting into the spring recess in the ring when the lamp was pushed up into its place. Thus the lamp could be freely turned round its vertical axis in the spring

recess, and as different contacts were thus put in circuit either or both of the filaments were rendered incandescent. Thus revolving the lamp a short distance changed its candle power. Although the patentee first described this specially-designed holder as an intermediate fitting between the ordinary socket and the lamp, he also pointed out that the special holder might be formed upon a permanent socket and as part of it, and without any intermediate fitting, and if the upper socket was so formed, it would be adapted to receive his lamp with its projecting ring or rib. The third claiming clause claimed this modified form of the apparatus as a portion of the patented invention. But this form of the invention was practically identical with the apparatus described in the patent of Edison and Hill, No. 22,327 of 1895, which was a clear anticipation. In his opinion, the first patent sued upon was invalid for want of novelty. The novelty in the second patent sued upon was to be found in the cap of the lamp. No special form of holder was required. The lamp was adapted for the bayonet socket-holder in common use. The device, which enabled the filaments of different resistance in the same lamp to be used separately or together, consisted of a wire passing completely through a transverse opening in the upper part of the cap, its ends projecting sufficiently to engage in the notches of the bayonet socket. The opening on each side of the lamp through which the wire passed was elongated horizontally, and the wire was pivoted in the centre of its length to a vertical pivot in the centre of the cap. The wire could thus move freely backwards and forwards to the extent of the length of the slot in the cap, and either or both of the contact pieces connected with the filaments could thus be put in circuit. The advantages of this lamp were its extreme simplicity and its being adapted for nearly all fittings in common use. In his opinion, the invention, although very simple, was extremely ingenious and meritorious. There was a problem to be solved requiring invention, and this the patentee had done. Until this invention, there was not any variable lamp on the market without a switch upon the lamp itself which was capable of being used in the ordinary fittings in common use, unless some intermediate or adjusting piece was also employed. Many thousands of these lamps had already been sold. He had arrived at the conclusion that the invention was new, useful and had not been anticipated. Hunter and Jack's patent, No. 3,426 of 1894, was quite different, and Edison and Matthews, No. 7,530 of 1894, which was also relied on by the defendants, had nothing to do with the plaintiffs' invention. It was also contended that the plaintiffs' patent was invalid, as Claim 2 was an independent claim to the user of a screw nut upon the end of a wire affixed to the holder to permit it to change its position, and that the use of such a nut for such a purpose was one of the oldest devices. In his opinion the patentee was merely describing a method of affixing the invention to the holder as an advantageous method of using it where special circumstances rendered it expedient—in case of vibration, for instance. The objection to the plaintiffs' second patent failed, and he decided in favour of its validity. There would be an injunction restraining any further infringement of the plaintiffs' second patent, the plaintiffs to have the costs of the action, except so far as they were increased by the claim in respect of the first patent.

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### C. J. FERGUSON AND SONS *v.* PANDIANI.

IN the Lord Mayor's Court last week, before the Recorder and a jury, plaintiffs, electrical engineers, of 54, Chiswell Street, E.C., sued Mr. John Shirley Pandiani, agent, trading as the Electrical Industries, City Road, E.C., for £14 12s. 11d., the price of an electric fan supplied by the defendant, which it was alleged was defective.

For the plaintiffs it was stated that they received an order to supply an electric ventilating fan for the Cabin Restaurant in Moorgate Street, and they approached the defendant. The latter undertook to get them a fan and said that he would warrant it for 12 months. It was supplied on July 23rd of last year, and was subsequently fixed in the restaurant. It was not, however a success. When working it made a very loud noise, and occupants of offices above lodged complaints about it. The defendant was informed, and the makers of the fan (Messrs. Haywood, London) sent a man down to repair it, but it was still unsatisfactory. Finally the fan had to be taken down and a new one supplied. The plaintiffs now claimed for the amount they had paid for the fan, together with the expenses they had been put to in attempting to make it work properly.

Evidence in support of the plaintiffs' case was given by Mr. C. W. Ferguson, who said he only went to the defendant because he thought he would be supplied with an Italian fan. In the past it had been his experience that Italian fans worked satisfactorily, and he was surprised when an English-made fan was sent to him.

The JUDGE remarked that he was greatly surprised to hear that English manufacturers could not make satisfactory electric fans.

Witnesses were called for the plaintiffs, who spoke about the noise the fan made. One said that when the fan was working it made a noise like a sawmill, and another said that it resembled the starting of a motor-'bus.

For the defence, it was argued that the fan was placed at the bottom of a galvanised iron shaft, and that this carried every sound to the neighbouring offices. The defendant stated that he supplied a box bladed fan to the plaintiffs, which was what they ordered. He agreed that such a fan was unsuitable for the purpose for which it was required, but he only supplied what was ordered. Fans of that description always made a noise. It was not correct that the faster a motor ran the more noise it made. In fact, the reverse was the case.

A representative of Messrs. Marples, Leach & Co., said that he had examined the fan and found that it was in good working order. Such fans always made a noise, and he agreed that one of them would be unsuitable for the work to which it had been put by the plaintiffs. It was impossible to construct a motor of that particular type for an alternating current that would work absolutely quietly. It was not surprising that the fan in question had been complained about.

The jury, without waiting to hear all the evidence for the defendant, returned a verdict for the defendant.

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### BO'NESS ELECTRIC WORKS ASSESSMENT.

AT the Glasgow Court of Session last week, the Provost, Magistrates, and the Councillors of Bo'ness and the National Electrical Construction Co., Ltd., appealed against the decision of the Valuation Committee of the County Council of Linlithgow in connection with the valuation of the electric works and generating station and the mains throughout the burgh of Bo'ness. According to the *Glasgow Daily Herald* the assessor's valuation was £650 on the works and £650 on the mains, and the appellants had contended before the Committee that the total valuation should be £400, which was the sum at which the subjects were assessed for 1906-7. They maintained that there had been no change of circumstances during the year to warrant the assessor increasing the valuation, and that not only was £1,300 a grossly excessive valuation, but £400 was the utmost figure at which the undertaking could now be expected to let. The Valuation Committee considered that £400 was an arbitrary sum and was not a fair annual valuation of an undertaking upon which there had been expended a capital sum of £23,946, and on account of which an annual payment of £1,650 or thereabouts was made by the Electric Co. to the Town Council. On the other hand, they thought that, looking to the fact that the undertaking had only been established for three years, and was not yet in a very prosperous condition, it was not reasonable to put so high a valuation upon it as had been suggested by the assessor. They accordingly resolved to take the capital cost of the works at £23,946 and to fix the annual value at 3 per cent. on the cost, or £720, allocating £390 to the works and £330 to the mains.

Their Lordships upheld the Committee's decision. LORD LOW said he was not prepared to say that the figure which had been named by the Committee of the County Council—which was, he admitted, a random figure—was not as fair an estimate of what a tenant would give one year with another for a period of years for this undertaking, as could be made.

LORD DUNDAS concurred.

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### THOMAS ALLWRIGHT *v.* L.C.C.

IN the King's Bench Division on Tuesday, before Mr. Justice Bray and a common jury, plaintiff employed as a stock-keeper by Messrs. Park, Davis & Co., wholesale druggists, sued the defendants for damages for personal injuries sustained on February 18th, 1907, through being jerked off an electric tramcar owing to the sudden starting of the car when he was climbing up the steps. Plaintiff was laid up for six weeks and suffered from nervous shock. The defendants said the car started in the ordinary way, and the plaintiff must have suddenly lost his balance. The jury awarded plaintiff £50 damages, and on account of a payment of a larger sum into Court, judgment was entered for the defendants with certain costs, and certain other costs were given to the plaintiff.

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### CLARKE *v.* L.C.C.

BEFORE Mr. Justice Bray and a common jury in the King's Bench Division, on Monday, plaintiff, a drayman, was awarded £500 damages with costs against the defendants for personal injuries sustained on December 18th, 1906, through an electric tramcar colliding with a dray which he was driving along the Clapham Road. The plaintiff was thrown into the roadway and a wheel of the dray passed over his right leg, crushing his ankle.—The defendants denied negligence, and evidence was given that the magnetic brake did not act, but the speed of the car was diminished by the applicatioh of the hand brake, and the gong was sounded when the car approached the dray from the rear.

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**Bell Installation.**—The division bells at the Belfast County Hall have recently been changed, and a controller put in so that the whole of the 20 bells in the various lobbies and offices work in unison. The bells and controller were manufactured by MESSRS. MAXWELL, of Belfast, and are wound for 50 ohms. They all work in parallel off duplicate sets of accumulators charged from the street mains. The effect of having the controller in the circuit gives the bells a very distinct synchronism so that no confusion arises as to the intention of the sound.

## PARLIAMENTARY.

### London United Tramways Bill.

This Bill came on Monday before Messrs. Campion and Jeune, the Examiners, for proof and compliance with Standing Orders.

Mr. Cripps (Parliamentary agent) explained that all the orders had been complied with, except that there was a question of the consent of certain local authorities, *i.e.*, the Corporation of Richmond, the Urban District Council of Brentford, the Surrey County Council, and the Middlesex County Council. The proposal to which these referred was that of the construction of tramways across King Edward VII Bridge at Kew.

Mr. Baker was called on behalf of the company, and produced the consent of the Richmond Corporation. He said that the proposal to take tramways across the bridge had been before the House in 1904 and 1906. In 1906 the Brentford U.D.C. gave their consent to the scheme, but when this year the company applied for their consent they passed a resolution to the effect that they would neither assist nor oppose. He produced the consent given in 1906. In 1904 the Surrey County Council gave a definite consent to the proposal, but laid down the condition that the company should pay £1,000 a year rent to them, repair and maintain the whole of the carriage way, and pay one-third of the cost of keeping the structure in repair. The Middlesex County Council also gave consent on similar conditions, except that they wanted about £1,250 a year rent. What it came to was that the company were asked to pay about £2,250 a year for about three furlongs of tramways.

Mr. Cripps urged that the resolutions which had been carried by the County Councils amounted to consents for Standing Order purposes. It was impossible for the Examiners to go into the question of whether the company should pay £2,250 a year for the consent but that was a matter which would have to be settled by the Private Committee which would consider the Bill.

Mr. Jeune pointed out that the promoters were required to prove the consent, and it was not for him to go into the question of the reasonableness or otherwise of a refusal.

Mr. Cripps pointed out that the County Council did consent subject to certain conditions, and that was a consent to the principle. The case of the Brentford U.D.C. was somewhat different, as they consented to an exactly similar scheme in 1906, and now said they did not want either to assent or oppose.

Mr Campion said they could not make the consent of one session applicable to another. The Examiners would have to report non-compliance in the case of Brentford and the County Councils of Surrey and Middlesex.

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**Cost of Telephones.**—In reply to questions on Tuesday, Mr. Sydney Buxton stated that the minimum charge at small post office provincial exchanges is £5 a year for an exclusive line, and £4 4s. a year for a two-party line. The calls of subscribers very seldom exceed the minimum numbers allowed for these sums. These rates cover connections within one mile of an exchange. An additional charge of £1 5s. per quarter mile, measured radially, is made for extra distances. In Norway the charges for an independent circuit in places outside Christiania vary from £2 4s. to £3 18s. a year, but there are usually entrance fees also to be paid, and additional payments have to be made for double-wire circuits. The radius is less than one mile. Beyond this radius subscribers pay the capital cost of constructing their lines. There are also additional charges for maintenance of lines outside the radius, and in some cases subscribers provide and maintain their own instruments. In Norway materials and labour are much cheaper than in England, the standard of construction is much simpler and less costly, and their are fewer wayleave difficulties. The cost of a trunk call to London from a place 100 miles distant would be 1s. In Norway the corresponding charge would be 9½d. for the ordinary service, but about 2s. 4d. for an urgent call. Ordinary calls take effect only when there are no urgent calls on hand. In rural districts the users of trunk lines have to find office room and attendance free for the Government.

**West London, Barnes and Richmond Tramways Bills.**—The above Bill, which incorporates a new company with a capital of £240,000, came before Mr. Jeune, one of the Examiners, for proof of compliance with Standing Orders, on Monday. Mr. Cooper, Parliamentary agent, said he would have to take a non-compliance in regard to all the consents of local authorities except that of the Corporation of Richmond. The Bill will accordingly have to go before the Standing Orders Committee, who will decide whether it shall be allowed to proceed.

**Croydon and Southern District Tramways.**—In the case of this Bill, which came before the Examiners on Monday, the promoters admitted that they had failed to obtain the consent of several local authorities, and accordingly the Bill will be reported as having failed to comply with Standing Orders.

**Second Readings.**—In the House of Lords on February 19th, the South Wales Electrical Power Distribution Bill was read a second time.

In the House of Lords on February 20th, the Metropolitan District Railway Bill, the Great Northern, Piccadilly, and Brompton Railway Bill, and the London Electric Supply Bill passed second reading.

## BUSINESS NOTES.

**South African Industrial Exhibition.**—Messrs. Woods, Monahan & Co., of Cape Town, have just completed the lighting of the South African Industrial Exhibition, where they installed 12 arc lamps, 2,000 32-c.p., and 16-c.p. incandescent lamps, and also fixed five motors for the machinery to be shown in motion. The whole of the wiring was carried out in three weeks. The same firm also have on hand the installation of electric light, telephones, and bells for the new offices of the Commercial Union Association Co., which they are carrying out in Conrex tubing.

**New Turbine.**—A company for the exploiting of a new steam turbine is being formed in Sweden. The company, which will have a share capital of minimum 500,000 kr., maximum 1,500,000 kr., has for its object the making of a turbine newly invented by the Swedish engineers Ljungström and Forsberg.—*Affärsvärlden.*

**Annual Dinner.**—On Saturday last the employés of Messrs. Rawlings Bros. Ltd., of 82, Gloucester Road, Kensington, and Halkin Street, Belgravia, held their fifth annual dinner at the Horseshoe Hotel, Tottenham Court Road, Mr. J. J. Rawlings, one of the managing directors, being in the chair. Over 100 of the employés were present. Mr. H. Turmaine gave the toast of "The Firm and Directors," which was responded to by Mr. R. Tweedie Smith, the chairman of the company, who returned thanks in humorous vein. Mr. J. J. Rawlings said their business had gone forward in spite of the undoubted trade depression, and they had always made it their endeavour to find employment for all their employés during the periods of exceptional slackness. He felt bound to refer to the progress of the motor department which was forging ahead steadily. In responding for "The Visitors," Mr. J. H. Wiggington (of Messrs. Taylor, Lovegrove & Co.) said that a good deal of the firm's work came under his professional notice, but his supervision was more formal than necessary. Mr. W. R. Rawlings gave the toast of "The Employés." Mr. F. Appleyard and Mr. T. Clarke responded. The latter called for musical honours for the directors, which were heartily given. The various toasts were interspersed and followed by a number of well-received musical items.

**Brook Single-phase Motors.**—Messrs. E. Brook, Ltd., of Colne Road, Huddersfield, have lately made considerable additions to their machinery, in order to compete with the demand for their single-phase motors. According to a new price list just received, they are manufacturing motors ranging from ¼ to 20 h.p., their output being more than 1,000 motors a year at, they claim, a price which enables them to successfully compete against foreign motors. The construction of the motors is very substantial, and a fair amount of over-load is provided for. The list before us sets out prices in red, and gives speeds, size of pulleys, &c., for 50 and 100-cycle motors. Other lists, which are bound together in the same filing cover, give prices of repairs to s.p. motors and starters, also prices of polishing motors on stands from 1 to 8 h.p. for grinding purposes, and particulars of clutch beds for s.p. motors; there is further an instruction sheet for fixing and connecting the motors, and a few figures are given showing the horse-power required to drive a number of different classes of machinery.

**Marseilles Electrical Exhibition.**—H.M. Consul-General at Paris has received a letter from the Commissariat-General of the Exhibition, calling attention to the motive-power facilities offered by the Committee. Special groups (Nos. II, III, IV, X and XVIII) have been created, the exhibitors in which will be allowed to avail themselves of the motive-power required to show their apparatus in motion.—*Board of Trade Journal.*

**Busy Bennis.**—During the year 1907 Messrs. E. Bennis & Co., Ltd., who have been busy B.'s as usual, carried out a very large number of contracts for their mechanical stokers and coal elevating and conveying plants. We understand that 62 per cent. of the business done in their "Bennis" sprinkling stoker and self-cleaning compressed air furnaces consisted of repeat orders—a very gratifying experience for the firm. A list of the stoker contracts carried out during the period named includes, in addition to electricity works, a variety of manufacturing trades and industries, such as textile manufactories, ironworks, collieries, steel works, oil mills, breweries, sugar refineries, engineering works, &c. Mechanical coal and ash handling plant with overhead coal and ash bunkers and automatic weighing apparatus, supplied to the order of the Corporation Electricity Department of Coventry, was valued at £5,000, while that erected to the order of Messrs. J. & P. Coats, Ltd. (for Messrs. Clarks' branch, Anchor Thread Mills, Paisley), was of the value of £3,200, and consisted of a complete coal and ash-handling and storage plant for twelve Lancashire boilers, being practically a duplicate of a similar plant installed at Messrs. Coats's Ferguslie Mills some years ago. Messrs. Burnyeat Brown & Co., Nine Mile Point Colliery, Cross Keys, on the advice of their consulting engineer, placed an order of the value of £1,645 for a complete coal and ash handling plant.

**The American Westinghouse Lamp Co.**—According to a Reuter telegram from Trenton, N.J., Judge Lanning, of the United States Circuit Court, the other day ordered the receivers of the Westinghouse Lamp Co. to restore the business to the company. Creditors whose claims upon the company are for amounts under $200 will be paid immediately, and creditors for larger amounts on January 1st next.

**Book Notices.**—*Notes on the Patents and Designs Act*, 1907. London: Lloyd, Wise & Co. Price 1s.—This pamphlet, issued by a well-known firm of engineers and patent agents, deals especially with the alterations effected in the patents law of this country by the Act which came into force this year; the authors do not confine themselves to a mere exposition of the provisions of the Act, but also comment critically on many of them, and give valuable hints and warnings to the inventor and would-be patentee.

*Queen's Engineering Works Magazine*, January, 1908; No. 5.—This is a magazine which is published annually at the works of Messrs. W. H. Allen, Son & Co., Ltd., Bedford. It is well known that Messrs. Allen have in force an admirable system of apprenticeship, which provides not only for the manual training but also for the theoretical instruction of their pupils, and the magazine is found an excellent means of keeping in touch with their old pupils and apprentices at home and abroad. The frontispiece is a portrait of the chairman of the company, Mr. W. H. Allen, J.P. Amongst the editorial notes we observe one to the effect that the company has commenced the manufacture of steam turbines. An account of the inauguration dinner of the Society of Past and Present Pupils, in June last, is given, and the Hon. Sec., Mr. H. R. Howlett, 43, Castle Road, Bedford, appends a note to the effect that by December 12th 49 members had joined, whose names are given. The magazine contains interesting articles on the Nile, technical education in Germany, the "Allen" Institute, the annual prize distribution, progress in the Works during 1907, and other matters, and is nicely got up on art paper.

"Thermo-chemistry." By Julius Thomsen. Translated by K. A. Burke. London: Longmans, Green & Co. 1908. Price 9s. net.

*Technical Literature*, which has its offices in New York and is published in England by Messrs. Archibald Constable & Co., Ltd., of 10, Orange Street, Leicester Square, W.C., will henceforth bear the more explanatory title, *The Engineering Digest*. Monthly 1s.

"Stationary Steam Engines." By W. H. Fowler. Manchester: Scientific Publishing Co. 1908. Price 12s. 6d. net.

"One and All Gardening." 1908. Edited by E. O. Greening. The Agricultural and Horticultural Association, Ltd., 92 Long Acre, London, W.C. 2d.

We have received a copy of "Rules for Electrical Installations," issued by the Royal Insurance Co., Ltd., of 28, Lombard Street, London, E.C.

**Motor-Tower Wagon for Wigan.**—MESSRS. WALKER BROS., of the Pagefield Ironworks, Wigan, have lately supplied a petrol motor-tower wagon to the Wigan Corporation for use in connection with the municipal electric tramways.

**Trade Announcements.**—MESSRS. TETLEY & CO. have appointed Messrs Fyfe, Wilson & Co., of 74, York Street, Glasgow, as their sole selling agent for Scotland for all types of switchboard, switchgear, liquid resistances, and, indeed, all Tetley specialities.

MESSRS. HARRAWAY BROS. have commenced business at 45, King's Road, Sloane Square, as electrical engineers. Manufacturers and wholesale agents are invited to send catalogues, show cards, &c., of electrical fittings, shades, accessories and accumulators.

Mr. Frank Wardrop, London manager of Messrs. W. C. Martin and Co., has joined Mr. Edw. J. Hogan, late of the Sunbeam Lamp Co. MESSRS. HOGAN & WARDROP are trading in all classes of electrical supplies.

MR. CHAS. ROSS, electrical engineers and contractor, Walsall, has opened new business premises at 21, Leicester Street.

We understand that the old-established firm of GEIPEL & LANGE has change its name to Geipel & Co., Mr. Lange having retired from the business some 18 months ago as already announced.

**Catalogues and Lists.**—MESSRS. W. MCGEOCH AND CO., LTD., 28, West Campbell Street, Glasgow.—Three leaflets describing several lines of new specialities recently brought out by the firm. Brief particulars, with illustrations and prices, appear of gas-tight switches and fuses, M.G. type tubular switch fuses for circuits up to 500 volts, and S.D.B. type main switches for 250 volts.

THE UNION ELECTRIC CO., LTD., Park Street, Southwark.—A small booklet of 12 pages, entitled "Factory Lighting," showing some reasons why factories should be well lighted, should be lighted by electric arc lamps, and most of all should be lighted by "Union" arc lamps. The comments open with "Seeing Things" as the heading, but if we were a gas journal—which we are *not*—we should want to be "saying things" about those two middle illustrations, showing factories and streets "lighted" respectively by gas and electricity—a look on this picture then on that sort of comparison. Contractors who want to make use of this little pamphlet in trying to obtain electric lighting installations should drop the company a line and copies will be forwarded. The Union Co. has also brought out a new list of enclosed and semi-enclosed arc lamps for alternating current-circuits. Prices appear of line resistances, transformers, globes and reflectors, and some suggestions relating to circuit arrangements are set forth.

MESSRS. LE CARBONE, 17, Water Lane, Great Tower Street, E.C.—Small pocket pamphlet referring generally to the Le Carbone carbon dynamo and motor brushes.

MESSRS. BEANLAND, PERKIN & CO., School Close Works, Leeds.—Leaflet relating to "Gresolvent," a new preparation for cleansing the hands from grease, paint, &c., for which great things are claimed. A sample tin was sent us, which we have certainly found effectual and convenient.

MESSRS. HENRY PELS & CO., 9, Portsmouth Street, Lincoln's Inn Fields, London, W.C.—20-page catalogue giving very clear views plainly showing details of their Johns' patent punching and shearing machines.

THE ELECTRIC CONTROLLER AND SUPPLY CO., 47, Victoria Street, S.W.—Postal card directing attention to their "Dinkey" "U" type of controller for light service.

WESTMINSTER ELECTRICAL TESTING LABORATORY, York Street, Westminster.—Twenty-four page pamphlet giving full information and scale of fees.

HABIRSHAW WIRE CO., Yonkers, New York.—Small 25-page pocket pamphlet containing a reprint of an article on "Rubber Insulation for Conductors," written by Fred J. Hall for an American contemporary.

MESSRS. REAVELL & CO., LTD., Ranelagh Works, Ipswich.—New leaflet (No. 12) containing a brief illustrated description of their small enclosed automatic lubrication high-speed engines for driving dynamos, fans, pumps, &c.

MESSRS. FRANK SUTER & CO., LTD., 66, Berners Street, London, W.—Sixteen-page illustrated price list of their "Suterlite" reflectors and other patent reflector devices for picture gallery, show-case, shop window (interior and exterior) lighting, &c. A large postal card also received shows the "Suterlite" method adapted to use in drawing offices.

MESSRS. ALFRED HERBERT, LTD., Coventry.—Thirty-page booklet admirably printed and illustrated on thick glazed paper, dealing with bar work and chuck work, the statements made being based upon experience gained in the firm's own turret lathe department, where they have 120 machines turning out work varying from a $\frac{1}{16}$ in. grub screw to a 20 in. gear blank.

MESSRS. WARD & GOLDSTONE, Springfield Lane, Salford.—New price list (16 pages) dealing with their electrical motor-car accessories and accumulators.

MESSRS. ERNEST F. MOY, LTD., Greenland Place, Camden Town, N.W.—Hanging card giving prices of bright steel set screws with rolled threads formed by Moy & Bastie's new patent rotary screwing die.

THE STERLING TELEPHONE AND ELECTRIC CO., 200, Upper Thames Street, London, E.C.—Pamphlet No. 136, giving illustrated information and price particulars of waterproof mining, ship and engine-room telephones; also No. 139, describing their patent gas and water-tight trembling bells, accompanied with a full-size detailed drawing of the 6-in. size.

TITAN PACKING CO., Tower Royal, London, E.C.—Leaflet relating to "Solvis" jointings.

MESSRS. LASSEN & HJORT, 52, Queen Victoria Street, London, E.C.—Copy of their latest catalogue (64 pages), in which, after dealing with the treatment of water generally, they proceed to fully describe, with the aid of instructive sectional views, the Lassen and Hjort patent automatic water-softener and the Standard de-oiler. Half-tone views of a number of representative installations follow, and a list of electricity works, railways and so forth using the firm's apparatus, appears at the end of the book.

THE CRYPTO ELECTRICAL CO., 155-157, Bermondsey Street, London, S.E.—Leaflets illustrating and describing, and giving prices of single, two-, and three-phase A.C. motors, and combined A.C. to C.C. transformers.

MESSRS. ARTHUR CORT & CO., 303½, Camberwell Road, London.—Wholesale price list of insulating hard or flexible vulcanised fibre for electrical and other purposes, also of belting, ebonite, vulcanite, &c.

MESSRS. MATHER & PLATT, LTD., Salford Ironworks, Manchester.—Copy of the ninth edition of their catalogue of steel-clad motors. Its 20 pages—well arranged, as usual, and in the company's standard size and style—contain descriptive matter with tabulated information showing speeds, B.H.P. dimensional and weight particulars, of open, protected, dust and flame-proof and entirely enclosed and air-tight motors. Starting and regulating switches are also particularised.

MESSRS. GEO. M'CARTNEY & CO., Burnside Works, Cumnock, N.B.—A number of lists in expanding binder, giving particulars, prices and illustrations of their "Orb" switchgear, including main switches—double, triple and four-pole, fuse-boxes, switch-fuses, quick-break main switches, tubular replacement fuses and switchboards.

**Tantalum Lamps.**—We are informed by MESSRS. DRAKE & GORHAM, LTD., of 66, Victoria Street, S.W., wholesale agents for the tantalum lamp, that they are now in a position to supply these lamps for use on alternating-current circuits. Those interested should write to the firm for their special pamphlet on this subject, which is about to be issued.

**Dissolutions and Liquidations.**—ACCUMULATOR AND MOTOR CONSTRUCTION CO., LTD.—This company (meeting at 262, Holloway Road, N., on February 18th) resolved to wind up voluntarily, with Mr. Jesse Smith, 79, Queen Street, E.C., as liquidator.

SIR HIRAM S. MAXIM CAPTIVE FLYING MACHINE CO., LTD.—This company is winding up voluntarily, with Mr. J. A. H. Macnair, of Gresham House, Old Broad Street, E.C., as liquidator.

DENTON ELECTRICAL CONSTRUCTION CO., electricians and engineers, 11, Ashton Road, Denton, Manchester.—Messrs. G. S. Aveyard & J. Hallsworth have dissolved partnership.

**Electric Floating Crane for Montreal.**—The *Shipping World* states that a contract for a 75-ton self-propelling floating crane for Montreal has been awarded to Messrs. Vickers, Son & Maxim. The barge is to be built at Barrow-in-Furness, but the crane structure and electrical equipment will be supplied as a sub-contract by Messrs. Appleby's.

**Alleged Robbery.**—At the Old Street Police Court this week a number of men were brought up on remand on a charge of being concerned in stealing and receiving quantities of gutta-percha, the property of the Telegraph Construction and Maintenance Co., Ltd. Their names were Boniface, Laws (two), Humphries, Branch, Cole, Gibbons, Sims and Fribbins.

## LIGHTING and POWER NOTES.

**Accrington.**—The electric lighting and general installation in the new furnishing stores erected by the Accrington Co-operative Society, and opened on Saturday, was carried out by Messrs. J. L. Kendal & Co., of Manchester. Altogether there are 550 21-c.p. tantalum lamps.

**Aldershot.**—The U.D.C. has decided to support the Hastings T.C. in the effort to secure powers to enable local authorities to wire consumers' premises and to supply fittings and motors on hire.

**Argentine.**—The municipality of Laprida has contracted with Senor Cattaneo for the construction of an electric light station for the public and private lighting of the town.

**Ashton-under-Lyne.**—The L.G.B. has again refused the application of the B. of G. for a loan of £2,000 for E.L. plant at the Workhouse Hospital. The L.G.B. previously refused the loan in October, 1905.

**Baildon.**—An E.L. scheme has been submitted to the U.D.C. by the Bradford Electrical Engineering Co., and is to be considered next month.

**Bexley.**—The U.D.C. has for the present abandoned the projected assisted wiring scheme.

**Bolton.** — Messrs. H. Bessemer & Co., the well-known steel firm, are asking the T.C. to reduce its charges for electric supply to their iron and steel works at Bolton, failing which concession they propose building a power station within the works, which are situated in the centre of the town.

**Cheadle and Gatley.**—The B. of T. has revoked the 1900 E.L. order.

**Continental Notes.** — Germany. — The town of Charlottenburg was suddenly plunged into darkness on the 19th inst. by a failure of the electric supply. Three railway stations, several theatres, and innumerable restaurants were affected by the stoppage, which lasted half an hour, and was caused by a rat, which had jumped in among the bus-bars at the power station. This is the second occasion on which Charlottenburg has been deprived of light by such a cause.

Italy.—Application has been made to the authorities of the province of Brescia for a concession to put down plant to utilise the water-power of the River Oglio, at Vizza d'Oglio, in the generation of electrical energy for lighting and power purposes.

Spain.—A concession has recently been granted for a plant to be put down to utilise the water-power of the River Fluvia, at Crespia, in the generation of electrical energy for lighting and power purposes.

Sweden.—The investigation of the water-power of the Norr and Söderforsarna in the Ume River has resulted in the discovery that the disposable power amounts to 81,000 h.p. delivered to the Brännland station, at a distance of only 15 kilometres from the sea and from the town of Umea.—*Affärsvärlden.*

**Douglas (Isle of Man).**—The T.C. has by 11 votes to 10, refused the request of a Special Committee appointed to consider the advisability of providing electricity works for the town, to engage an expert to advise it in the matter. The opposition was based on the ground that the town could not at present afford to establish electricity works.

**Dunfermline.**—We understand that the T.C. selected Sir Alex. Kennedy to submit estimates of the cost of the alternative schemes proposed in lieu of carrying out his recent recommendations. However, a fresh deadlock has been caused by Sir Alex. Kennedy writing the Council stating that in view of the fact that it did not act upon his recent recommendation, he could not accept the appointment.

**Edinburgh.**—In connection with the condensing scheme for the M'Donald Road Station, two 1,200-kw. exhaust steam turbo-generators are to be installed in addition to four surface condensing plants. Pending the installation of the turbines, the existing plant will be run direction to the condensers.

**Epsom.**—The R.D.C. has passed a resolution consenting to the application of the Woking Electric Supply Co., Ltd., for a prov. order for E.L. at Cobham.

**Farnham.**—The U.D.C. has by five votes to four decided to consent to the use of overhead wires by the Farnham and District Electric Supply Co., Ltd., on condition that the generating station is within the Council's area.

**Gillingham.**—The General Electric Co. and Siemens Bros. recently wrote to the T.C. alleging that the Council has been selling electric lamps at lower rates than private firms. While the Council decided to ask the companies for their authority for the allegation of underselling, it also resolved to revert to the list prices for the sale of lamps.—*Ironmonger.*

**Hanley.**—A L.G.B. inquiry was held on February 19th into the application of the T.C. for a loan of £18,000 for the extension of the electricity undertaking. It transpired that £10,455 represented excess expenditure, and to prevent a recurrence of this the loan applied for was increased to £21,969. There was no opposition.

**Heanor.**—The Tradesmen's Association has appointed a deputation to wait upon the U.D.C. with the object of inducing the Council to adopt an E.L. scheme. Mr. A. E. Loos, general manager of the Derbyshire and Notts. Electric Power Co., has prepared for the Association the outline of a scheme, the cost of which is estimated at £4,500.

**Heywood.**—According to the latest estimates, the cost of the extensions to be carried out at the Corporation electricity works will be close upon £10,000. The work will be put in hand forthwith.

**Hoylake and West Kirby.**—The U.D.C. has received from the L.G.B. sanction to a loan of £2,209 for E.L. purposes.

**Huddersfield.**—At the meeting of the T.C. on the 19th inst., the yearly statement of the electricity department was presented, from which it appeared that the gross receipts were £30,354, and the expenditure £19,369. The net balance was £985, which was placed to the depreciation and contingencies fund, the latter now standing at £11,874.

**Kidwelly.**—A committee of the T.C. has been appointed to go thoroughly into the matter of electric lighting for the town, for which several firms have been asked to forward proposals.

**Liverpool.**—Turbines are still on the tapis as a result of questions in and out of the Council respecting the efficiency of the Westinghouse turbines installed at the Lister Drive generating station. The most recent development transpired at the meeting of the Tramways and Electric Power Committee on Friday February 21st, when the chairman (Sir Chas. Petrie) referred to the deposition by the Liberals of the deputy-chairman of the Committee (Ald. T. Smith), and the latter said that all he had done was to refrain from leading a Liberal attack on work he had helped to accomplish. When the matter of the turbines came before the Council last week, Alderman Smith defended the electrical engineer in the installation and working of the turbines. Meanwhile, the demand for an inquiry is still being persisted in.

**London.**—L.C.C.—At a meeting of the L.C.C. on Tuesday, the Finance Committee reported that the Woolwich Borough Council had applied for the advance of £3,000 to cover expenditure incurred up to September 30th, 1907, and to be incurred in the purchase of electrical apparatus for letting on hire and for wiring consumers' premises on the hire-rental system. The amount applied for was composed of £1,000 for arc lamps, £1,150 for motors, £350 for radiators and £500 for wiring work. The Borough Council was empowered to carry out the work by its Act of 1903, and the Committee recommended that the loan should be advanced at 4 per cent., repayable in ten years. Sir Melville Beachcroft moved that the matter should be referred back to the Committee for further consideration, and report. He objected to the County Council providing money out of the general fund to enable Woolwich to undertake work in competition with private enterprise. In seconding the amendment, Mr. E. White said it would be most undesirable for the Council to set a precedent, as if that was done other Borough Councils would make similar applications. Mr. Squires, a Woolwich member, informed the Council that the loan was required to pay off a debt already incurred. The amendment was defeated, and the recommendation of the Committee was adopted.

Hammersmith.—In June, 1903, the Borough Council resolved to provide a reserve fund in connection with the electric light undertaking, and at that time the sum of £2,500 was carried to the credit of the fund. Nothing has since been added, but £7,000 has been transferred from the funds of the undertaking to the relief of the rates. At the last meeting of the Council the Finance Committee's recommendation that a further sum of £2,500, being part of the accummulated surplus of £3,500 not yet appropriated, be carried to to the credit of the reserve fund, was agreed to.

Fulham. — The Electricity and Lighting Committee of the B.C. has agreed to support the joint action of the Association of Municipal Corporations and the Incorporated Municipal Electrical Association, representing 164 municipalities, relative to securing amendments to the draft regulations regarding electrical energy, in connection with which a B. of T. inquiry is to be held. The Committee has resolved in favour of petitioning the B. of T. to again introduce the Supply of Electricity Bill in the present Session of Parliament.

**Merthyr Tydfil.**—The T.C. has asked the Merthyr Electric Traction and Lighting Co., Ltd., to submit terms for lighting the Merthyr Vale and Aberfan districts by electricity.

**Mountain Ash.**—The U.D.C. has decided to petition against the South Wales Electrical Power Distribution Co.'s Bill.

**Norwich.**—The B. of G. has decided to accept an offer of the T.C. to install and maintain electric light in the workhouse, the supply to be given at the same cost as with the gas lighting at present in use.

**Port Glasgow.**—Of late negotiations have been in progress between Port Glasgow and Greenock Corporations regarding the supply of electricity which, it was suggested, the latter should furnish. Impatient at the delay experienced in coming to a satisfactory arrangement 18 Port Glasgow firms, including seven shipbuilding companies, decided to petition the T.C. to co-operate with them in order to have the negotiations with Greenock carried through with all possible despatch. It was also decided to ask Greenock T.C. to obtain the necessary Parliamentary powers. The matter was considered at last week's meeting of the T.C., when it was decided to again ask a definite statement of terms from the Greenock Corporation, and ascertain exactly what co-operation the petitioning firms want.

**Rochdale.**—At a L.G.B. inquiry held on Tuesday, with reference to an application of the T.C. for power to borrow £22,175 for purposes connected with electric lighting, it was stated by the town clerk that there had been a considerable increase in the consumption of electricity during the last four years. For lighting it had advanced from 239,000 to 366,000 units, for power from 290,000 to 466,000 units, and for traction purposes from 630,000 to 1,896,000 units. The total increase had been from 1,600,534 to 2,728,688 units. The net profits on the works in 1905 were £1,196 and in 1907 £4,136. It was stated by the electrical engineer, in answer to an inquiry by the Inspector, that the works had received from the rates £5,500 and had repaid £5,350 up to the present time, in the form of contributions to the borough fund.

**Rotherham.**—The Electric Light and Tramways Committee of the Corporation is considering the advisability of purchasing a turbo-generator.

**South Africa.**—At a recent meeting of the East London T.C., a report of a Special Committee on the reorganisation of the electric power scheme was considered, and after a lengthy discussion was adopted. The report recommended the abandonment of the existing power station and the immediate construction of a new one. The estimated cost of the proposed scheme is £35,000.

**Stockton.**—The B. of T. has revoked the Rural District E.L. order of 1902.

## TRAMWAY and RAILWAY NOTES.

**Accrington.**—The Corporations of Haslingden, Accrington and Rawtenstall, who have recently electrified their tramways, have agreed to hold a joint conference on matters affecting the interests of all three bodies.

**Argentine.**—The Bill granting a concession to Messrs. Otto Franke & Co. for a high-speed electric railway between La Plata and Buenos Ayres, has been definitely approved by the Legislature of the Province of Buenos Ayres.—*Review of the River Plate.*

**Belfast.**—At the weekly meeting of the Electrical and Tramway Committee on the 24th inst., Mr. Andrew Nance recommended the acquisition of three sets of Tierney's automatic point controllers at £80 each for experiments. If successful they will be applied to all the points, the total cost being about £3,500. The present system, by which the points are moved by boys, costs £1,750 per annum. The tenders for the supply of cables for the coming year were referred to a sub-committee for report.

**Birmingham.**—Terms for the temporary working of the tramways between Perry Barr depôt and Chain Walk have been arranged with the Handsworth U.D.C., as follows:—(1) The Corporation to provide cars at the rate of £1 10s. per car per week; (2) the Handsworth Council to pay working expenses at the rate of 5½d. per car-mile; (3) to provide electrical energy, and to maintain the permanent way; (4) the Corporation to maintain the overhead equipment; and (5) to hand over to the Hansworth Council all the receipts earned upon the cars. This arrangement is subject to reconsideration immediately the outstanding questions between the Handsworth Council and the company which has control of the Aston tramways are settled, so that through services can be arranged.

The Committee has found it necessary to order 30 additional cars, which will be supplied by Messrs. Dick, Kerr & Co.; it has also decided to fit three of the new cars with Maley's patent electro-mechanical track brake, which is being used on the Leeds Corporation tramways, and was described in this paper recently.

**Bolton.**—According to an official report issued by the B. of T., the capital authorised for the Bolton tramways is £632,760; the capital paid up totals £527,333. There has been expended on the permanent way £223,368; electrical equipment of line, £71,154; street improvements, including purchase of land necessitated by the tramways and land and buildings, £112,667; tools and plant, £3,430; on the construction or purchase of lines and works, now superseded, £78,050 (which has to be written off); cars, £60,659, and other matters, £481. The capital expenditure totals £471,759. The length of lines open aggregates 26 miles 33 chains. The gross receipts for the year ending March, 1907, were £110,935 from passengers and £359 from other sources—a total of £111,294. The number of cars in stock was 96.

**Bradford.**—A sub-committee has been appointed to consider and report on the question of making provision by superannuation, thrift fund, or other means, for workmen who may be thrown out of their employment in the department, by reason of age or physical infirmity.

The Tramways Committee has taken a 14 years' lease, from April 1st next, with the option of purchase, of commodious premises in Hall Ings, for use as central offices.

As a result of the great public convenience arising from the adoption of overlapping stages, the general manager is to report on suggestions for the establishment of additional overlapping stages.

The dual gauge truck invented by Mr. C. J. Spencer and Mr. Dawson, his assistant engineer, having proved satisfactory in its trials, negotiations are in progress with a view to settling terms for the establishment of a through service of cars between the two cities.

**Brentford.**—The U.D.C. has decided to call on the L.U. Tramway Co. to repave its track on the main road and replace all worn metals, as the Council is of opinion that much of the noise complained of is due to the defective state of the track. Failing compliance with the request, proceedings are to be taken under the Tramway Act of 1870.

**Bristol.**—At a meeting of shareholders of the Bristol Tramway Co. this week, Sir George White, the chairman, explained that additional generating plant was required at their Counterslip power house before any further extensions of their system could be worked. They had been considering whether the new installation should take a turbine form, but eventually decided to adhere to the same character plant as had served them so well, and to make such additions as would increase their capacity by 50 per cent. The new installation would be completed within three or four months. This would give them ample power for the various extensions authorised, and the first line to be taken in hand would be that to Westbury or Trymn (Westbury is now served by the company's motor-'buses). The shareholders approved of an application to Parliament for an extension of time of the period for carrying out the proposed additional lines.

**Cheshire.**—The subject of electrification was introduced at the half-yearly meeting of the Wirral Railway Co. at Chester on Monday. The Chairman said there had been rumours as to the electrification of their line, and regarding that, he explained that £225,000 had been set down in the accounts for the estimated cost of electrifying and equipping their line. They had, moreover, obtained the necessary Parliamentary powers to raise that amount. In the opinion of the board of directors it was necessary to prepare themselves for that eventuality, and they had been carefully watching the results of electrical working in the country. He did not think anyone could say such results were satisfactory from an investor's point of view, and before electrical working in their case became commercially possible, there must be a cheaper installation, and the working expenses must be covered.

**Continental Notes.**—Switzerland.—*L'Elettricista* for January 15th reports that within a short time the Swiss railways are going to be converted to electric working. A sum of 85 million fr. has been estimated and already voted to deal with 2,500 km. of the principal lines. This is about one-fifth of the Swiss railways. It has been decided also to follow this work by dealing with the secondary lines in the shortest possible time.

Holland.—The Oosterbeck municipal authorities are considering a scheme by M. Blaste, of Amsterdam, for the construction of an electric tramway from Ede to Waldfriede and Arnheim, with branches (*a*) from Waldfriede to Oosterbeck and Westerbouwing; and (*b*) from the latter place to Arnheim, thus completing a circle.

Spain.—The Barcelona Municipality has managed to obtain the Government's sanction to an arrangement by means of which all the tramway concessions in the town will fall due and revert to the Municipality on the same date, viz., December 31st, 1945. The concessions are held at present by the Barcelona Tramways Co.; La Cia. An. de Barcelona; Ensanche, Gracia; and the Cia. Nacional de Tramvias.

**Croydon.**—The Tramways Committee reported to the B.C. on Monday that it had considered the various memorials recently presented asking that the extension of the tramways from Croydon to South Norwood *vio* Woodside, for which Parliamentary powers were long ago obtained, should be proceeded with. However, having regard to the nature of the report made by the manager (Mr. T. B. Goodyer), it deferred making any recommendation until the accounts for the present year have been made up. It is understood that the manager believes such an extension would be unprofitable.

**Cuba.**—The Havana Central Railway is contemplating the construction of 50 miles of electric railway line.

**Egypt.**—According to *African Engineering*, the Heliopolis Oasis (Egypt) Electric Railway has been completed.

**Handsworth.**—As a result of negotiations with the B.E.T. Co. in London, it is understood that there is a possibility of the cable tramways being converted to electrical working before

the expiration of the lease in 1911. The committee has a scheme before it for providing tramways from Perry Barr to the Soho Road.

**India.**—According to the *Bombay Gazette*, the Delhi tramways are expected to be in operation next month. The system includes 10 miles of route, for which 24 cars are provided. The work has been carried out by Messrs. Bruce Peebles & Co., Edinburgh, and will be handed over to the Delhi Electric Tramways and Lighting Co. on completion. It is contemplated to use the tramways for the carriage of goods from the railway depôts and for municipal sanitary purposes. The company also anticipates a demand for motor supply to the local trades.

**Leicester.**—At a meeting of the T.C. on Tuesday, the annual report of the tramway department for the year ended December 31st, 1907, was presented. The report showed that the total revenue amounted to £116,845, an increase of £318; and that the passengers carried numbered 27,417,227, a decrease of 50,757. The cars ran 3,334,924 miles, an increase of 2,926 on the previous year, whilst the total receipts averaged 8·408d. per mile. The working expenses amounted to £70,887, an increase of £1,947 over last year; and the gross profit totalled £45,958, against £47,587. After all expenses had been met, a net balance of £10,539 was shown, against £13,110 in 1906. The cost of generating 5,815,750 units at the power station was slightly higher per unit than was the case in the previous year, due to the increased price paid for coal (10s. 6d. per ton, against 8s. 7d.).

**Luton.**—The new tramways, which are described elsewhere in this issue, were opened on the 21st inst., Mr. T. G. Ashton, M.P., performing the opening ceremony, which was followed by a luncheon at the Town Hall.

**Manchester.**—Some interesting facts regarding the city tramways undertaking were given by Alderman E. R. Wilson at a meeting the other night. The cost of the undertaking to the Corporation has been £1,750,000; and of the 143,264,000 passengers carried last year, Mr. Wilson said those who paid a penny fare formed 69 per cent. The department paid in rates £25,000 a year, as against £8,000 by the old company, while the reduction in fares had been as from 2d. to 1·19d. The reduction of the hours worked by the employés and the increase in the rate of wages cost £50,000 a year, and their 4,174 workpeople took £5,400 a week in wages. The average cost of laying down a mile of track was £5,270, with an additional £1,090 for overhead equipment, and he was pleased to say that all the material used was English, except certain points at junctions which, until three years ago, were not manufactured in this country. The average takings per day were £1,950.

At the Tramway Committee's meeting on Tuesday, reference was made by the chairman to the fact that the department had been heavily hit of late by claims for compensation on account of accidents. At the same time, he had to report that two men convicted of perjury at the present assizes had been sentenced to terms of imprisonment in connection with a recent unsuccessful claim in the Manchester County Court.

**Oldbury.**—A Birmingham and Midland car proceeding from Dudley to Oldbury ran off the line near the Oldbury boundary on the 20th inst., and overturned, seven people being injured and the conductor killed. It is stated that the car was proceeding at a moderate speed and that the near wheels jumped some points. An inquest relative to the death of the conductor was opened on the 21st and adjourned to the 27th.

**Portsdown.**—The Board of Trade has confirmed the Portsdown and Horndean Light Railway Order (1908).

**Rotherham.**—It is expected that the work of doubling the existing track from Rotherham to the Tinsley terminus, a distance of about 3 miles, will very soon be commenced, the R.D.C., which has control of the Tinsley roads, having given formal sanction on Monday. As in the case of the Dalton Brook extension of the Rotherham Corporation system, the work of widening will be carried out by the Corporation. The doubling of the track will result in a considerable saving of time in the through journey from Rotherham to Sheffield.

**South Africa.**—JOHANNESBURG.—It will be remembered that owing to the failure of the gas engines, the T.C. in May last terminated the contract, and demanded from the sureties £105,134. The sureties have since been negotiating on the subject with the T.C. in private. On Saturday last a basis of agreement suggested by the Select Committee was published in a local paper, whereupon the negotiations were suspended, and the members of the committee resigned. A special meeting of the T.C. was held later, when allegations were made against one Councillor of selling information to newspapers. The old committee was re-elected by ballot with one exception.

Messrs. Weightman & Amery have secured the contract for the construction of a tramline from Johannesburg to High Street, Newtown, at £10,507.

**South Australia.**—In order to facilitate the early running of the electric tramcars in Adelaide, an agreement has been made between the Municipal Tramways Trust and the S.A. Electric Light Co., Ltd., for the latter to supply the required power until the trust has built its own power house and installed the necessary machinery. It is the trust's intention to erect the power house at Port Adelaide.—*Australasian Hardware and Machinery.*

# TELEGRAPH and TELEPHONE NOTES.

## Telegraphic Interruptions and Repairs:—

| | | Interrupted, | Repaired, |
|---|---|---|---|
| **Cables.** | | | |
| Curacao-Coro<br>Curacao-La Guayra<br>Curacao-Maracaibo | Closed.. .. .. | Jan. 12, 1906 .. | .. |
| Tarifa-Tangier .. .. .. .. .. | | Jan. 18, 1904 .. | .. |
| Port Arthur-Chifu (Closed) .. .. .. | | Mar. 9, 1904 .. | .. |
| Paramaribo-Cayenne .. .. .. .. | | Jan. 11, 1908 .. | .. |
| Cayenne-Brazil .. .. .. .. .. | | Jan. 27, 1908 .. | Feb. 24 |
| Alexandra-Larnaca .. .. .. .. | | Jan. 28, 1908 .. | .. |
| Trinidad-Demerara .. .. .. .. | | Feb. 5, 1908 .. | Feb. 21 |
| Tangier-Cadiz .. .. .. .. .. | | Feb. 10, 1908 .. | .. |
| **Landlines.** | | | |
| Puerto-Barrios .. .. .. .. .. | | Aug. 2, 1902 .. | .. |

**Telephone Rates.**—Reviewing the results of, and comments upon, the recent interview with a deputation from Chambers of Commerce, &c., the Postmaster-General considered that there existed some misapprehension as to the policy of the Post Office in connection with the new schedule of rates. He has, therefore, invited the associations concerned to select a small number of delegates, representing the small and moderate user as well as the large user, who shall privately discuss the matter with him in detail, and arrangements are being made to carry out this proposal.

**Wireless Telegraphy.**—Some six weeks ago Mr. Marconi was reported to have said:—"In two or three weeks the [trans-Atlantic] service will be ready to be thrown open to the public." We do not know the cause of the delay, but these premature statements seem to be a habit of the Marconi Co., which by no means adds to their reputation for accuracy. The comments of the Postmaster-General on the present value of wireless for commercial use may be of interest in this connection; they appear in our report of the annual dinner of the Institution of Post Office Electrical Engineers.

The German Reichstag has passed the second reading of the Bill for the regulation of wireless telegraphy, conferring a monopoly of wireless telegraphy upon the Government. The German Government desires to maintain an attitude of neutrality towards all systems of wireless telegraphy, and in particular to secure intercommunication on the part of ships and land stations without regard to the system employed. Germany has accordingly declined to bind herself to any one system.—*The Times.*

## CONTRACTORS' COLUMN.

### Openings for New Business.

ABERDARE.—Houses at Cwmaman for W. J. Brayshaw, 26, Glanant Street Aberdare, and W. E. Willis, builder, Pentre.

(LLWYDCOED).—Villa residence and stables, &c., for J. F. Hodges Brondeg, Newport (Mon.).

ACCRINGTON.—New Corporation baths (£9,000).

ARBROATH.—Extension of works for A. Shanks & Sons, engineers.

Extension of premises for J. Law & Sons.

New station for North British Railway Co.

ASHTON-UNDER-LYNE.—New Wesleyan Chapel at west-end of town.

Houses, Mossley Road, for Schofield & Wrigley, and Cowper Street for S. H. Farrer.

Alterations and extensions to the Central Liberal Club premises. Lindley & Gibson, architects, Ashton-under-Lyne.

BALLYCLARE.—New manse for the Committee of the Second Ballyeaston Presbyterian Church. N. Fitzsimmons, architect, 13, Lombard Street, Belfast.

BARNES AND MORTLAKE.—Houses, Thornton Road, for Geo. Hunt, and business premises, corner of Upper Richmond Road, for W. Spicer.

BARNSLEY.—New schools at Silkstone for the West Riding of Yorks C.C. J. Vickers-Edwards, county architect, County Hall, Wakefield.

WORSBROUGH).—Houses, Mount Vernon Road. A. Whitaker, architect, Worsbro' Bridge, Barnsley.

(DARFIELD).—Ten houses. Ernest Hammerton, architect, The Poplars, Darfield.

Houses, Worsbro' Dale, for G. Porter & Sons and B. Turner, and Worsbro' Common for Mr. Rusby.

(GREAT HOUGHTON).—Houses. P. A. Hinchliffe, architect, 14, Regent Street, Barnsley.

BATTLE.—Alterations and additions to infirmaries at the Union Workhouse. H. Blackman, architect, Catsfield, Battle.

BECKENHAM.—Houses, Cromwell Road, for G. Weaver; Mackenzie Road, for A. W. Keen; Croydon Road, for H. Slade.

BIRKENHEAD.—New aniline dyeworks, South End, for a German firm.

BOLTON.—Fifty-two houses in New Hall Lane and Glen Eddon Road, Heaton, Bolton. Mr. H. Haywood.

New retort house at Lunn Street gasworks. Corporation.

New school for Zion Baptists. Potts, Son & Hennings, architects. St. George's Road, Bolton.

BOURNEMOUTH.—Railway hotel to be rebuilt.

BRISTOL.—Enlargement of Brislington Church. Rev. I. Jones, pastor.

New bank for Bristol and Counties Banking Co. in St. Stephen's Avenue. W. H. Watkins, architect, Clare Street, Bristol.

New Presbyterian Church, Cranbrook Road. P. Munro, architect, Baldwin Street, Bristol.

CAMBERLEY (SANDHURST).—Villa residence, Mr. Brake, Farnborough, Hants.

CARLISLE.—House and shop, Eden Street, Silloth, for A. W. Brown. Matthew Johnstone, architect, Carlisle.

CARNARVON.—Motor-car works for the Kiwi Engineering Co., Carnarvon.

CARSHALTON.—Houses, Mayfield Road and Ridgway, for P. V. Windebank.

COLWYN BAY.—New church at Mochdre.

COVENTRY.—New school in Broomfield Road for the Coventry Education Committee.

New school at Foleshill. Messrs. Steane, architects.

New elementary schools in Albany Road and Broad Street for the Coventry Education Committee.

CRADLEY HEATH (STAFFS.).—Station extensions for the Great Western Railway Co. (£20,000).

CRANLEIGH (SURREY).—House and stabling. W. Buck, architect, Sunnyhill, Hurst Road, Horsham.

CREWE.—Large new sewerage scheme (nearly £60,000). Crewe Corporation.

CUPAR (FIFE).—New shop and saloon for J. Scott, draper.

DEVONPORT.—New soldiers' and sailors' home scheme under consideration (£8,000).

DONCASTER.—New bank, Baxter Gate, for Nottingham and Notts. Banking Co., Ltd. Philip Brundell, architect, 1, Princes Street, Doncaster; Denniss Gill & Son, builders, 8, Nether Hall Road, Doncaster.

DUBLIN.—Extension and alterations to St. Joseph's Convent (£10,000). Conway & Sons, Dublin, contractors.

DUDLEY.—Improvements at Jesson's School.

Re-building the workhouse for the B.G. Bateman & Bateman architects, 81A, Edmund Street, Birmingham.

DUNDEE.—Alterations and additions to property for A. M. Brown.

Alterations to house at Tulloch Crescent. J. Thomson, city engineer.

EARLSHEATON.—New men's institute in connection with Highfield Church (£800).

EBBW VALE (MON.).—Church and parish hall. Rev. F. Williams, Clergy House, Ebbw Vale.

ECCLES.—New school at Peel Green. Eccles Education Committee.

EDINBURGH.—Alterations to portion of George Heriot's school. P. Macnoughton, clerk, Heriot Trust Offices, 20, York Place, Edinburgh.

EDMONTON (MIDDLESEX).—New technical institute adjacent to the Town Hall.

EPSOM.—Iron Church, for Canon Hunter, Christ Church.

Pair of villas and detached house in Denham Road, for Mr. W Wiltshire.

FLEETWOOD.—New works for an East Coast Trawling Co. New company.

Theatre. Projected by a number of St. Anne's gentlemen.

FRESHWATER (ISLE OF WIGHT).—New Church. White Bros., builders, Freshwater.

FLIXTON (LANCS.).—New Council School. County architect, Preston.

GALWAY.—Additions and alterations to Ballyhail Castle.

GREENFORD (SOUTHALL).—New hotel at Greenford Park, for Sich & Co.

GREENOCK.—Proposed Government torpedo factory at Battery Park.

GUILDFORD.—Porter's lodge and receiving block at the Union Workhouse. E. L. Lunn, architect, 36, High Street, Guildford.

HASLINGDEN.—George and Dragon Hotel to be rebuilt, for the trustees of the late Henry Barnes.

HALSTEAD (ESSEX).—New school for Halstead Grammar School. Goodey and Cressall, architects, High Street, Colchester.

HANLEY.—New office premises. E. Jones & Jackson, architects, 10, Albion Street, Hanley.

HASLINGDEN (LANCS.).—New refuse destructor works (£8,400). Haslingden Corporation.

HEMSWORTH.—Working Men's Club at Frickley Colliery, for the Carlton Main Colliery Co.

HERNE BAY.—Semi-detached villas, Buller's Avenue, for A. Wilson.

HIGH WYCOMBE.—Show-rooms, timber stores, &c., for Joynson, Holland and Co., chair manufacturers. Hooper & Nash, architects, Church Square, High Wycombe.

Houses, Dashwood Avenue, for W. Joynson.

New Wesleyan Day Schools at Lane End. Hooper & Nash, architects, Church Square, High Wycombe.

HITCHIN.—Houses, Brampton Estate, for A. J. Hope, Letchworth; and A. G. Monk, Hitchin; and bakery for W. B. Moss & Sons, Portmill Lane.

HOLSWORTHY.—Renovation of the Wesleyan Chapel.

HORSELL (SURREY).—Enlargement of the Church (£2,000). Mr. Unsworth, architect.

HOUNSLOW.—Addition to factory in Staines Road. J. Stanley, Beldam.

HUDDERSFIELD.—Houses at Hill Top, Slaithwaite, for John Jagger.

ILFORD.—Houses, Bradford Road, for J. W. Hammond; Ladysmith Avenue, for J. L. Smith; Felbrigge Road, for A. C. Corbett; and Colenso Road, for E. J. Shirling.

JARVIS BROOK.—New Church in Station Road.

JOHNSTONE (N.B.).—New Masonic Hall.

LANGHOLM (N.B.).—Conversion of premises in High Street and John Street into Post Office.

LEEDS.—Premises in Elland Road for Kraft & Hornung. G. F. Bowman, architect, 5, Greek Street, Leeds.

Workrooms and synagogues, &c., Templar and Bridge Streets. C. W. Richardson & Sons, architects, Westgate, Wakefield.

LEICESTER.—Hall in connection with All Souls' Church (£1,800). Rev. C. Carleton, vicar.

LIMERICK.—Annexe to Union (£2,600).

LONDON.—(SOUTHFIELDS).—Nine houses in Pulborough Road. Woodley Bros. Woodhouse, Wimbledon Road, Tooting Graveney, S.W.

(ST. PANCRAS).—Workmen's dwellings in Prospect Terrace (£13,650). Joseph S. Smithem, 82, Queen Street, Cheapside, E.C., architects.

(ISLINGTON, N.).—Workhouse casual wards. Architect not yet appointed.

CANNING TOWN, E.).—Alterations and additions to Prince Arthur beer house. W. Stewart, 4, Aldgate, E., architect.

(LEADENHALL STREET, E.C.).—Adaptation of premises for Lyons and Co., Cadby Hall, Kensington.

(KENSINGTON, S.W.).—Improved E.L. of portion of Town Hall. Surveyor, Kensington Borough Council, High Street.

(DEPTFORD).—Rebuilding warehouse in Briant Street. W. J. Dixon, 3, Blue Anchor Lane, S.E., builder.

(KILBURN, N.W.).—Alterations to 301-303, High Road. Trant, Brown & Humphreys, 332, High Road, Kilburn, N.W., architects.

(CRICKLEWOOD, N.W.).—Shop and dwelling house, Temple Road. Done, Hunter & Co., High Road, Cricklewood, agents.

(BROMDESBURY).—Buildings on site of Wyndham House. H. B. Oldrey & Son, 7, West End Lane, N.W., builders.

(HARLESDEN).—Alterations to 114, 116, 118, High Street. Done, Hunter & Co., High Road, Cricklewood, agents.

(WILLESDEN).—Twelve houses in three roads. C. W. B. Simmonds 69, Exeter Road, Brondesbury, N.W., builder.

LONDON.—(NORTH LAMBETH).—Alterations to publiclibrary. G Mr. Wakeford, 267, Clapham Road, S.W., architect.

(KENNINGTON OVAL, S.E.).—Three blocks of buildings. Chas. Barker, 5, Maley Avenue, West Norwood, surveyor.

(WEST NORWOOD, S.E.).—Additions to St. Saviour's Almshouses. Langston & Co., 1, Hop Exchange, S.E., surveyors.

(NORWOOD, S.E.).—New St. John's Vicarage (£3,000).

(UPPER TOOTING).—New church rooms and church officer's house, for the St. Peter's Church. Rev. J. S. Roose, minister, St. Peter's.

New Hospital for Mental Diseases scheme (£30,000).

(WEST NEWINGTON, S.E.).—School (£4,949). Galbraith Bros., Camberwell Green, builders; T. J. Bailey, architect, Education Department, L.C.C., Spring Gardens, S.W.

(HAMMERSMITH, W.).—Enlargement of school and new training centre (£4,142). W. Johnson & Co., Wandsworth Common, builders; T. J. Bailey, Education Architect, L.C.C., Spring Gardens, S.W.

(POPLAR).—New warehouse. E. Hawthorn, "Carlinghurst," Sylvan Road, Snaresbrook.

(KINGSWAY).—Commercial Exchange. Robt. J. Worley, 70, Strand, W.C., architect.

(WANDSWORTH).—New school (£12,929). Holliday & Greenwood, Brixton, S.W., builders; T. J. Bailey, Education Architect, L.C.C., Spring Gardens, S.W.

(REGENT'S PARK).—Shops in Park Street. T. B. Westacott, 74, Camden Road, N.W.

(BRIXTON, S.W.).—Additions and alterations to Police Station (£7,280). J. Dixon Butler, Surveyor to the Metropolitan Police, New Scotland Yard, S.W.

(STEPNEY).—Iron school for L.C.C. (360 places). W. Harbrow, Iron Buildings Works, South Bermondsey.

(LAMBETH).—Alterations, &c., to Mortuary. Henry Edwards, 346, Kennington Road, S.E., borough engineer.

(KENSINGTON).—Rebuilding shop in High Street (£3,400). Arthur Bond, Bush Lane House, Cannon Street, E.C., architect.

(HACKNEY, N.E.).—Installation of electricity at works (40, Kenton Road) of G. Oldfield & Sons, ropemakers.

(TOOTING).—Stables in Hirnley Road. H. Wakefield & Sons, 267, Clapham Road, S.W., architects.

(BRIXTON).—Buildings in Lyham Road. Dartnell & Banks, 34, High Street, Croydon, architects.

(CITY).—Additions to Temple House, Tallis Street. Gordon and Gunton, Finsbury House, Blomfield Street, E.C., architects.

(PLAISTOW).—Alterations to "Railway Tavern" public House. J. M. H. Gladwell, Essex House, High Street, Stratford architect.

(PALMER'S GREEN).—School (600 places).—H. G. Crothall, Education Architect, Middlesex County Council, Guildhall, Westminster.

LUTON.—Six houses, Dunstable Road, Leagrave, for I. L. Ashton.

MANSFIELD.—Houses, Goldsmith Street, for A. J. Copestake; Mount and Albion Streets, for John Lucas; Carter Lane, for Somercotes Permanent Land Society; Alexandra Avenue, for John Beckett; Carter Lane, for Pipkin and Izzard; Foster and Cavendish Streets, for T. R. Lawson.

MARGATE.—New secondary school under consideration. Margate Education Committee.

MARPLE.—Alterations and repairs at Hollin's Mill.

MILKSHAM.—New Liberal club premises. Mr. Brinkworth, architect, Bath.

MENSTON (YORKS).—Detached residence for C. W. Curran. Rogerson and Dawson, architects, 40, Sunbridge Road, Bradford.

MOSSLEY.—Alterations and repairs at Brunswick and Croft Mills.

NANTWICH.—New Council School (accomm. 900), county authorities, Chester

NEWCASTLE-ON-TYNE.—Ten pairs of semi-detached houses, at Walker Gate, for the Wallsend Co-operative Society. E. Cratney, 35, High Street, Wallsend-on-Tyne; and T. E. Davidson & Sons, Pearl Buildings, Newcastle-on-Tyne, architects.

NEWTON HEATH.—New halls (£1,466).

NORTHFLEET (KENT).—Houses, Downs Road, for Mrs. B. de Quincey.

NORWICH.—E.L. to be installed at the workhouse.

NOSTELL (YORKS).—Offices and residence, for Lord St. Oswald.

NOTTINGHAM.—Proposed new school in the Meadows District, Trent Bridge for the Nottingham Education Committee (£24,200).

PAISLEY.—Engineering works at Colinslee, for J. Thom, jun. & Co. Lylesland.

PENRITH.—New school and master's house, at Matterdale. Surveyor Penrith, U.D.C.

PINNER (MIDDLESEX).—Development of West End estate. A. W. Marshall.

PONTYPRIDD.—Villa residence at Maindy, Ton Pintre, for Daniel Thomas. W. D. Morgan, architect, 194, Ystrad Road, Pentre.

New Council schools at Maesycoed. D. Milton Jones, Municipa Buildings, Pontypridd.

PRESTON.—Extension of St. Wilfrid's Church, Longridge (£3,000). W. Almond, builder, Pitt Street, Preston.

PRESTWICH (near MANCHESTER).—Sewage works scheme. Prestwich District Council.

PWLLHELI.—New church and manse at Hebron, Lleyn. W. W. Jones architect, Salem Place, Pwllheli.

RAMSGATE.—New Baptist Church in building in Queen's Road.

New Post Office. Secretary, H.M. Office of Works, Storey's Gate, Westminster, S.W.

READING.—New bakery for local Co-operative Society.

RETFORD.—Offices, &c., for Henry Spencer & Sons, auctioneers, and E. S. Spencer, solicitor, Market Square. Richmond & Sons, builders, Retford.

RICHMOND-ON-THAMES.—House, Manor Road, for Copp & Kear; and houses, Sheen Park, for Brewer, Smith and Brewer.

RINGSTEAD (NORTHANTS).—New Institute. F. E. Preston, architect, High Street, Rushden.

RINGWOOD.—Houses, "The Parsonage," Barn Lane, for F. Lawford; Middleton Road, for H. Barrow; and Fairlie Estate, for W. Guy.

RISHTON.—Fifteen houses and shop, Cliff Street West, for the Rishton Co-operative Society.

ROMFORD (ESSEX).—New Infants' School in London Road (accommodate 280) for the Essex Education Committee. A. S. R. Ley, architect, 54-55, Bishopsgate Street Without, London, E.C.

ROWLEY.—New elementary school in Doulton Road for the Education Committee. Education Committee's architects.

ST. HELENS.—Houses, Dilloway Street. John Rothwell & Son, builders Knowsley Road, St. Helens.

ALFORD.—Building for treatment of phthisis at Hope Hospital.

New Halton Bank Council School, Pendleton. J. H. Woodhouse, architect, Manchester; J. Ramsbottom, builder.

SANDHURST.—New villa in Branksome Hill Road. Mr. Brake, Farnborough Hants.

SHARLSTON.—Alterations and repairs at New Sharlston Provided School for the West Riding of Yorks C.C. J. Vickers-Edwards, County architect, County Hall, Wakefield.

SHEFFIELD.—Houses in Manor Lane. Thos. Millward, 11, Tylney Road, Sheffield.
SHEFFIELD PAUL (DEVONSHIRE).—New United Methodist chapel.
SHOEBURYNESS (GREAT WAKERING).—Explosives factory for the Government.
SITTINGBOURNE.—Extensive additions to paper mills for E. Lloyd, Ltd., Holborn, London.
SLOUGH.—Houses, Uxbridge Road, for A. Lidstone, and Victoria Road for A. Woolsey.
SOUTHEND-ON-SEA.—Additions and alterations at Overcliff Hotel for W. J. Head.
SOUTH SHIELDS.—Rebuilding Station Hotel, Laygate, High Shields, for J. B. Johnson. F. A. Page & Son, architects, 67, King Street, South Shields.
SPALDING.—New post office in the Sheep Market.
STIRLING.—New slaughter house (£8,000).
STOCKPORT.—Rebuilding and repairs at Winfilehurst Mill, High Lane, near Stockport.
SUTTON (SURREY).—Houses, St. James' Road North, for W. H. Forshaw.
THRAPSTON.—New Schools for Northants C.C. J. T. Blackwell, architect, High Street, Kettering.
TILBURY.—New bank, Dock Road, for the London and Provincial Banking Co., Ltd.
TREHERBERT.—Workmen's Library and Institute at Blaenrhondda. W. D. Morgan, architect, 194, Ystrad Road, Pentre.
TROWBRIDGE.—16 houses at Cockhill, for C. Crook.
TURRIFF.—Houses and shops for G. Ross, baker, Rothienorman.
New farm steading, &c., on Hatton estate. W. L. Duncan, architect, Turriff.
New School (£4,000). W. L. Duncan, architect, Turriff.
WALTON-ON-THE-HILL.—New Church.
WARRINGTON.—New paper works at Howley for Joseph Chadwick & Sons, Oldham.
WELSHPOOL.—Four semi-detached villas at Salop Road for W. Humphreys, Egremont, Welshpool. R. W. Davies, architect, Dolafon, Carno.
WIGAN.—E.L. installation at the Workhouse Infirmary for the B.G.
WILMSLOW (CHESHIRE).—New goods depôt and sidings. L. and N.W. Railway Co.
WINDSOR.—Additions to "The Forbury," Clewer, for Mr. Holliss.
WORTLEY.—New Infants' School in connection with Bethell Church (£1,500).
WRABNESS (ESSEX).—New Wesleyan Chapel. Messrs. Eade & Johns, architects, Tower Chambers, Tower Street, Ipswich.
YARDLEY.—New schools in Golden Hillock Road for the Education Committee.

## CONTRACTS OPEN and CLOSED.

### OPEN.

**Acton.**—February 29th. Meters, carbons, tubing, cables, &c., for the electricity department. See "Official Notices" February 14th.

**Australia.**—April 14th. Two cables between Victoria and Tasmania. See "Official Notices" February 21st.
QUEENSLAND.—April 20th. The Postmaster-General requires tenders for the supply of lead-covered cable according to Schedule Q, 46. Particulars may be obtained at the G.P.O. at Melbourne, Sydney, Adelaide and Brisbane.

**Austria.**—The municipality of Koelflach (Styria) is open to receive tenders for an electric lighting and power installation, lighting of the town, &c. Particulars may be obtained from the chief magistrate. Siemens Schuckertwerke have prepared a scheme.

**Beckenham.**—March 9th. Battery, booster, stokers, &c., for electricity works extensions for the U.D.C. See "Official Notices" February 21st.

**Belfast.**—March 11th. Arc lamp carbons for the Corporation. See "Official Notices" to-day.

**Belfast.**—March 16th.—Tramway stores for the Corporation. See "Official Notices" to-day.

**Birmingham.**—March 3rd. Extensions to main flues, economisers, boiler and engine foundations, &c., at the Corporation Summer Lane generating station. R. A. Chattock, city electrical engineer.

**Bremerhaven.**—March 2nd. Tenders are required by the Harbour authorities for 27 electric cranes (semi-portable type) for Kaiserhafen II and III. Conditions may be obtained at 3s. from F. Claussen, Bauinspektor, Bauinspektion für die Hafenerweiterung, Shupper No. 4, Neuer Kafen.

**Brussels.**—March 13th. A public adjudication will take place on March 13th, at the office of the Roads and Bridges Department, 8, Rue de Louvain, with regard to an electric lighting installation at the Mortgage Record Office at Charleroi. A deposit of £13 12s. is required. Specification No. 7 may be obtained at 3d., and plans at 2s., from the Bureau Commercial, 15, Rue des Augustins.

**Brussels.**—Tenders will shortly be called for by the Administration of the Belgian State Railways, 11, Rue de Louvain, for the construction and equipment of an electrical cabin at Louvain railway station. The estimate is about £570, and a deposit of £48 will be required.

**Bury.**—March 16th. Two 2,000-KW. turbo-alternators with exciters and condensers for the Corporation. See "Official Notices" February 21st.

**Cape Colony.**—March 18th. Dry cells (estimated requirements 2,000) for one year. Tenders per cell on printed forms obtainable from Controller of Stores, G.P.O., Cape Town. Tenders to Chairman of the Tender Board, Control and Audit Office, Parliament Street, Cape Town. For further information see *Board of Trade Journal*.

**Cologne.**—March 19th. Telegraph material for six large districts of the Prussian Government Railways is required, including 77,000 zinc elements, 74,500 copper elements, 858,000 rolls of Morse paper, &c.

**Coregna.**—March 16th. The Junta de Obras del Puerto de Coregna (La Coruña) require tenders by March 16th for supply and erection of three electric cranes. A deposit of 1,500 pesetas (about £50) will be required. Local representation is recommended.

**Dundee.**—March 2nd. E.H.T. three-phase and direct-current switchboards, sub-station converting machinery and apparatus, for the Corporation electricity department. See "Official Notices" February 14th.

**Dundee.**—March 6th. One year's stores for the Corporation tramways department; also carbons and oils for the electricity department.

**Edinburgh.**—March 4th. Electrical material for interior wiring for one year. Electrical Engineer, Dewar Place, Edinburgh.

**Erith.**—March 18th. Stores for the U.D.C. electricity works. See "Official Notices" to-day.

**Finchley.**—March 2nd. One 700-KW. high-speed engine and dynamo. See "Official Notices" February 21st.

**Franco-British Exhibition.**—Firms desirous of tendering for electrical work in connection with this Exhibition, will find a notice of interest among our "Official Notices" February 21st.

**Fulham.**—March 11th. General and electrical stores for the B.C. See "Official Notices" February 21st.

**Glasgow.**—April 13th. Two movable bridges over the Forth and Clyde Canal for the tramways department. Particulars from Mr. J. Dalrymple, general manager.

**Hackney.**—March 12th. Arc lamp carbons for the electricity department. See "Official Notices" February 21st.

**Handsworth.**—March 4th. 315-KW. engine and dynamo, feed pump, economiser and pipework, and switchgear, for the U.D.C. electric light and power department. See "Official Notices" February 7th.

**Heston and Isleworth.**—March 2nd. Cables, troughing, oils, and sundry electrical supplies for the U.D.C. See "Official Notices" February 21st.

**Hornsey.**—March 16th. Meters, fuse-boxes, cables, &c., for the T.C. See "Official Notices" February 21st.

**Ilford.**—March 10th. Stores, &c., for the electricity and tramway departments. See "Official Notices" February 21st.

**Kingston-upon-Hull.**—Three 500-KW. 2,250-volt D.C. dynamos for the electricity department. See "Official Notices" February 14th.

**Magdeburg.**—March 10th. Tenders are required for 30,000 telegraph poles, to be dipped in tar oil, at Stendal wharf by the Kaiserliche Oberfort Direction, whence particulars may be obtained by sending 1s. 2½d. in cash.

**Manchester.**—March 10th. Natural draught cooling towers for the electricity department. See "Official Notices" February 21st.

**Oporto.**—The municipal authorities will receive tenders until March 11th for a concession to construct and exploit electric tramways in the town and harbour.

**Radcliffe.**—February 29th. Low-tension three-core cable for the U.D.C. See "Official Notices" February 21st.

**Rio de Janeiro.**—March 26th. The Public Works Department requires tenders for works in Pernambuco, estimated at 49,411,671 milreis, including electric cranes, motors and transporters. For particulars apply to La Direction Générale des Travaux Publics, à Rio de Janeiro.

**Sophia.**—March 23rd. The Finanz Deputation requires tenders for electric cranes, motors, transporters, dynamos, &c., required for working the new port to be established at Sistow, at a cost of about £50,000. The Public Works Department requires tenders by March 23rd for the whole installation required to work an electric system of signalling between the guards' houses at the crossings and the stations on the whole of the lines of the Bulgarian State Railways. The system is based upon a combination of signalling and telephones. Particulars are obtainable from the Ministère des Travaux Publics Voies et Communications.

**Spain.**—March 16th. The Harbour Works authorities at Corunna are inviting tenders for three electric cranes.

**Spain.**—March 30th. The Spanish Ministry of Posts and Telegraphs is inviting tenders for the supply and laying of a submarine telegraph cable between Chatarinas and Nemours (Angolia). Particulars may be obtained from, and tenders are to be sent to, La Direccion General de Correos y Telegrafos, Madrid.

**Stoke-upon-Trent.**—March 14th. 300-KW. D.C. generator set, surface condensing plant, and water-tube boiler for the Electricity Committee. See "Official Notices" to-day.

**St. Pancras.**—March 23rd. Arc lamp carbons for the B.C. See "Official Notices" to-day.

**Uruguay.**—The Public Works Department requires tenders for electric cranes, dynamos, engines, &c., for working La Parivina port.

**Valparaiso.**—May 30th. The Junta Economica de la Direccion del Material of the Navy Department requires tenders for the equipment of the Chilian Navy with electrical instruments, motors and fittings. The successful tenderer will hold the contract for 5 years.

**Wakefield.**—March 14th. Surface condensing plant for the electricity works. See "Official Notices" to-day.

**Watford.**—March 11th. Supplies for the U.D.C. electricity department. See "Official Notices" to-day.

**West Ham.**—March 12th. One 3,000-KW. two-phase turbo-generator for the Council. See "Official Notices" to-day.

**Wimbledon.**—February 29th. Stores for the electricity department. See "Official Notices" February 7th.

**Wrexham.**—March 6th. Supplies for the T.C. See "Official Notices" February 14th.

## CLOSED.

**Birmingham.**—The Birmingham, Tame and Rea Drainage Board has accepted the tender of Messrs. Johnson & Phillips, Ltd., for the complete erection and equipment of a 6,600-volt transmission line in connection with the new storm-water pumping plant which is being installed—the contract for which was placed with Messrs. Johnson & Phillips, Ltd., some months back.

**Bradford.**—The following were successful tenderers for miscellaneous stores required in the tramways department during the year ending December 31st next:—

Wood & Saberton.—Bolts and nuts, rivets, &c.
Taylor & Parsons, Ltd.—Carriage bolts, &c.
Richard Mather.—Tools.
General Electric Co.—Lamp fittings, 16-C.P. lamps and white adhesive tape.
Geo. Maclellan & Co.—Pure para strip.
S. W. Whaley & Co. and Maurice Goggin.—Linen tape.
Brown, Muff & Co.—Tape, cleaning cloths, &c.
Quilliam, Ltd.—Sand bags.
Geo. Craddock & Co.—Strand wire and piano wire.
S. Peace & Sons.—Steel castings, chisel steel, &c.
British Insulated and Helsby Cables, Ltd.—Fuse wire.
Wilson, Pease & Co.—Cast-iron brake shoes.
Thornton & Crebbin.—Iron castings.
Wm. Towler & Co.—Malleable castings.
D. B. Rose.—Brass castings, ears, pull-offs, section insulator ends, &c.
Imeson Bros., Finch & Co.—Phosphor bronze and gun-metal castings, copper controller contacts, &c.
Electric Tramway Equipment Co.—Ears, pull-offs, hangers, and ears with cable terminals.
F. W. Rowlands & Co.—Steel pinions.
Henry Barrett & Sons.—Iron and steel bars, &c.
Crossley & Davenport.—Step and hexagon iron, and mild angle steel.
Cordingley Armstrong & Co.—Hoop iron.
Pinchen Johnson & Co.—Paints, varnishes, &c.
T. H. Newsome & Co.—Oils.
The Ruberoid Co.—Insulated tape.
Brookshank & Co. and Hartley Smith.—Oils.
Wood & Saberton, and Taylor & Parsons, Ltd.—Screws, &c.

The Tramways Committee has accepted the tender of Mr. A. C. Burnley, advertising contractor, London, for the right of advertising on the Corporation tramcars for a term of five years from the 1st inst.

**Croydon.**—The following tenders were accepted by the B.C. on Monday:—

Babcock & Wilcox, Ltd.—Coal and ash conveyor, £1,154.
Weber Concrete Construction Co.—Coal and ash bunkers, £681 14s.
St. Pancras Ironworks Co., Ltd.—Completion of switchboard flooring, £144.
Parsons, Fletcher & Co.—Supply of cylinder and crank chamber oils for the year (no prices stated).

**Hobart** (Tasmania).—Postmaster-General. W. T. Henley's Telegraph Works Co.—Lead-covered cable silk and cotton-insulated, with 104 pairs of 12½-lb conductors, £163; British Insulated and Helsby Cables, Ltd.—Hard-drawn copper wire, 70 lb. per mile, £532.

**Lochgelly.**—The Lochgelly Iron and Coal Co. has placed an order with Messrs. Johnson & Phillips, Ltd., for the complete erection of a 3,000-volt overhead transmission line for their Lochgelly works.

**London.**—The L.C.C. has accepted the tender of Messrs. Johnson & Phillips, Ltd., for supplying and laying cables in connection with the extension of tramways in Seven Sisters and Caledonian Roads.

The Highways Committee of the L.C.C. has accepted the tender of the India-Rubber, Gutta-Percha and Telegraph Works Co. for the supply of 300 plough bases, at 54s. each, and of 600 leads, at 4s. each. It is proposed to extend existing contracts with the Electric Construction Co. for motor-generators, so as to include an additional motor-generator of 50 KW. for the sum of £541 10s., and with Messrs. P. & W. Maclellan so as to include 115 tons of flat-bottomed rails, at £7 6s. 3d. per ton, together with bolts, fishplates, &c.

Stepney.—The B.C. is to place an order with the Tudor Accumulator Co., Ltd., for a battery of nine cells (in connection with the meter testing switchboard at the generating station), at £64.

**Melbourne** (Victoria).—Postmaster-General. George Sweet, Carlton.—5,850 conduits of 6 ducts each, and 3,750 conduits of 4 ducts each, £1,644; W. McLean & Co., Melbourne.—50 telephone wall sets, £3 4s. 3d. each—£160 12s.

**Norwich.**—The T.C. has accepted the tender of Messrs. Laurence, Scott & Co. for the supply of an electric motor pump for the Trowse Sewage Works, at £450.

**Southend-on-Sea.**—The T.C. has accepted the tender of the Chloride Electrical Storage Co. for a positive battery, at £420, with £37 15s. per annum for 10 years for maintenance.

**Sydney** (N.S.W.).—Postmaster-General. R. B. Hungerford, Sydney.—Five additional subscribers' sections, and one junction line section, and extension in connection with new switchboard at Central Telephone Exchange, Sydney.

**West Ham.**—The E.L. and Tramways Committee has accepted the offer of the Bell Punch and Printing Co., Ltd., to extend the contract for ticket punches for a period of three years at the rate of 12s. per punch per annum, instead of 15s. as per the present contract. This will effect an annual saving of about £52 10s. The offer of the present contractors, the Cryselco Co., for the annual supply of carbon lamps has been accepted at present contract prices, less 10 per cent. Messrs. Wm. Cory and Sons, Ltd., are to supply 12,000 tons of North Country coal at 10s. (a considerably more favourable price than obtained during the past year), and 12,000 at 9s. 8d. of North Country coal, a slightly lower calorific value accounting for the difference in price.

## FORTHCOMING EVENTS.

**To-day's Events** (Friday, February 28th).—At 9 p.m. Royal Institution of Great Britain. Prof. W. A. Bone on "Explosive Combustion, with special reference to that of Hydro-Carbons."

At 5 p.m. At the Royal College of Science, South Kensington. Physical Society. Paper on "Contact Potential Differences determined by Null Solutions," by Mr. S. W. J. Smith and Mr. S. Moss.

At 8 p.m. Royal Society of Arts. Dr. J. Scott Haldane on "The Removal of Dust and Fumes in Factories."

Saturday, February 29th.—At 10 a.m. Institution of Electrical Engineers. Students' visit to Brimsdown Power Station, N.M.E.P.S. Co. Meet at Brimsdown.

Tuesday, March 3rd.—At 8 p.m. Caxton Hall, Westminster, S.W. Civil and Mechanical Engineers' Society. "Notes on Engineering Works in Austria and Bosnia," by Mr. A. S. E. Ackermann.

At 7.30 p.m. At the University, Manchester. Institution of Electrical Engineers (Manchester Section). Paper on "Investigations on the Operation of Enclosed Fuses," by Prof. A. Schwartz and Mr. W. H. N. James.

At 8 p.m. Institution of Civil Engineers. "New York Rapid Transit Subway." Discussion to be re-opened by Lieut.-Col. H. A. Yorke.

Thursday, March 5th.—At 8 p.m. At the Institution of Civil Engineers. Institution of Electrical Engineers. Paper on "Fuse Phenomena," by Prof. A. Schwartz and Mr. W. H. N. James.

Saturday, March 7th.—At 3 p.m. Royal Institution of Great Britain. Prof. J. J. Thomson on "Electric Discharges through Gases." (Lecture I.)

Liverpool and District Electrical Association. Visit to works of British Insulated and Helsby Cables, Ltd.

Monday, March 9th.—At 8 p.m. Institution of Marine Engineers. Lecture on "Artificial Illumination, Historical and Practical," by Mr. A. E. Battle.

**Railway Crossing Fatality.**—On Tuesday last week at an inquest at Waterloo (Liverpool), on a man named Charnock, who was run over on the Liverpool Electric Railway at Waterloo on the 15th inst., the question of the responsibility for the level crossing was entered into. The District Council disavowed it, and as the L. & Y. Railway Co. did not appear to accept responsibility, it being stated that the crossing was originally a proprietary one, the jury recommended that the crossing, with others, should either be abolished, or put under control at once.

## NOTES.

**Institution Notes and Lectures.**—Institution of Electrical Engineers.—Prior to the last meeting of this Institution, held at Great George Street on the 21st inst., the President announced that with a view to commemorating the work of the late Lord Kelvin, the Council had decided to institute a Kelvin Lectureship, one lecture to be delivered annually; also that it is proposed to erect a Kelvin Memorial Statue in a prominent position in London, and that consideration is being giving to the forming of Kelvin scholarships.

Liverpool Engineering Society.—At a meeting on February 12th, Mr. W. D. Kirkpatrick read a paper on the electrical equipment of ships. He stated that the single-wire system had had to be abandoned. In the Navy only lead-covered cables were used, the insulation being vulcanised rubber. With auxiliary machinery throughout the ship the adoption of electric power had been proved to be the most economical.

Institution of Electrical Engineers (Students).—On Monday last, the fourth annual dinner of the Students of the I.E.E. was held at the Holborn Restaurant, Mr. E. W. Moss, chairman, presiding. After the toast of "The King," Mr. C. E. Abell (vice-chairman) proposed "The President and the Institution." Col. Crompton unfortunately was unable to be present. Replying for the Institution, Mr. W. M. Mordey remarked that after hearing Sir Oliver Lodge's lecture on the ether, he was glad he was not a student. He urged them to attend the meetings, and to visit works, and reminded them of Lord Kelvin's saying that human sympathy was more valuable than all learning. They ought also to study estimating and drawing.

Mr. Robert Hammond, proposing "The Students' Section," told a funny story of a dog and badger fight that did not come off, to illustrate the value of commercial acumen, and eulogised the virtues of good health and insatiable curiosity. Mr. E. W. Moss responded, deploring the poor attendance at the students' meetings, and announced that in July the Section would visit Newcastle.

Mr. B. A. M. Cooper proposed "The Colleges," and Prof. S. P. Thompson replied, pointing out that a college was not a mere building, but an association of students and teachers, and that when at college students formed friendships of the utmost value to them in after life.

Mr. Bernard Thompson (hon. sec. Students' Section) proposed "The Guests," and added to the list of subjects worth studying that of the sale of electricity. Mr. A. O. Laird responded, suggesting that the colleges should include a course on public speaking in their programmes. Thanks were tendered to Mr. G. H. Stevens, joint hon. sec., for his hard work.

During the evening a capital programme of musical and other entertainments was provided by some of the members and their friends; Mr. S. Driver, A.I.E.E., showed remarkable gifts, and Mr. C. B. Nadaud, the musical director, who modestly deferred his song to the last, would have been welcomed oftener and earlier.

**Electrical Contractors' Dinner (Dundee).**—On 19th inst. the members of the Dundee Branch of the Incorporated Electrical Contractors' Association dined together, with Mr. E. J. B. Lowdon, the president, in the chair. Mr. H. W. Warde, proposing the toast of the evening—"The Contractors' Association"—reviewed the history of that body. He said that its objects were less protective than to ensure a first-class standard of work. Now that the Association had established itself on a firm basis, he suggested that steps should be taken for the establishment of a benevolent fund, wide and generous in its operation. Mr. M'Whirter, replying, outlined the development of the Association, which, beginning with a small meeting of contractors, had now attained the dignity of a national movement, with headquarters of its own in London. Other toasts were the "Dundee Electricity Department," "Trade and Commerce of Dundee," "Electrical Trades," "City Electrical Engineer," and "The Dundee Branch."

**The Woltereck Patents.**—The following letter has been received from the secretary of the Sulphate of Ammonia Co., Ltd., 171, Queen Victoria Street, London, E.C., dated February 26th, 1908:—"The attention of my directors has been called to a paragraph in your issue of the 21st inst., with reference to the affairs of Dr. H. C. Woltereck, which is calculated to prejudice this company.

"I am directed to inform you that this company has been established to take over, and has taken over, all the patents in connection with the Woltereck process for the production of ammonia, together with the works at Carnlough, where the process was commercially and successfully demonstrated.

"Dr. Woltereck's financial difficulties have no relation whatever to this company, and I shall be glad if you will insert this correction to prevent any misconstruction of your note."

**The Copper and Brass Institute.**—We are informed that a meeting of copper and brass manufacturers, engineers and others was held in Manchester on February 13th, Mr. W. H. Johnson (Messrs. Richard Johnson, Clapham & Morris, Ltd., Manchester) presiding, at which it was unanimously resolved to form a "Copper and Brass Institute." The objects of the Institute are similar to those of the Iron and Steel Institute—viz., to afford a means of communication between members of the trades in question bearing upon their respective manufactures, excluding all questions connected with wages and trade regulation; and to arrange periodical meetings for the purpose of discussing practical and scientific subjects relating to the manufacture, working up and use of the non-ferrous metals. It is not the intention of the founders to limit the Institute to the copper and brass trades, but to include all those connected with the commercially important non-ferrous metals and their alloys—as lead, zinc, tin, aluminium, nickel, silver, gold, platinum, &c., and their alloys. In order to obtain a much wider and fuller discussion than was possible at the preliminary meeting, and to define the constitution and method of procedure of the Institute, a meeting is to be held in the Midland Hotel, Manchester, on Tuesday, March 10th, at 4 p.m., at which all who are interested are invited to be present. In a letter to us, Mr. Johnson says that it is hoped that the formation of this Institute will give an impetus to the important trades immediately concerned in the smelting and manufacture of copper, lead, zinc, aluminium, &c., "as well as trades less directly concerned—such as the great telegraph cable companies, the manufacturers of electric cables and electrical companies of all kinds." "Life without electricity is impossible nowadays, and without copper and aluminium, no electricity."

**Appointments Vacant.**—Two junior assistants in the Electrical and Electrotechnical Departments of the National Physical Laboratory (£100 to £150); engineer and clerk of works for Brecon and Radnor Joint Counties Asylum, Talgarth, R.S.O. (50s.); instrument inspector for the Hull Corporation telephone department.

**For Sale.**—The Birmingham electric supply department are offering for sale various engines, boilers, dynamos, and other steam and electrical plant at their Dale End station. Particulars appear among our advertisements to-day.

**American Telephone Contemporaries.**—The McGraw Publishing Co. have purchased *Sound Waves*, a Chicago monthly, and the *American Telephone Journal*, a New York weekly. The two journals appear as one consolidated weekly publication under the title of the latter from February 22nd.

**Electric Wire Accident.**—Our Belfast correspondent writes to state that whilst the terrific storm was raging on the 22nd inst. at Bushmills, a telephone wire broke, and in falling came into contact with the trolley wires of the Portrush electric tramway, and struck two horses which were passing at the time. One horse was killed on the spot, and the other badly injured. The drivers, two men named Creighton and Maconaghey, suffered from burns and shock in attempting to save their horses.

## OUR PERSONAL COLUMN.

*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* Electrical Review *posted as to their movements.*

**Central Station Officials.**—The Plymouth Electricity Committee has appointed Mr. F. G. Hayes, charge engineer, to succeed Mr. S. T. Allen as assistant electrical engineer, at a salary of £175 per annum.

The Southend-on-Sea T.C. has increased the salary of the electrical engineer, Mr. Birkett, from £450 to £500 per annum.

Mr. John Sommerville Highfield was married on February 22nd at St. Mary Abbots, Kensington, to Marina Julia Stretch, only daughter of Theodore Stretch, of Kent House, Kensington Court.

We beg to tender our sympathy to Mr. V. A. H. McCowen, city electrical engineer of Salford, whose wife died on February 23rd at the Gables, Kersal, Manchester.

**Tramway Officials.**—The Bournemouth tramway staff and employés have presented an illuminated address and a diamond ring to Mr. G. J. Lawson, J.P., for seven years chairman of the Tramways Committee, who has left the Council, "in recognition of his kindness, support and attention to their welfare."

The Blackpool Corporation tramway staff has presented a gold watch to Mr. H. S. May, resident engineer, who is leaving to take up a position with the L.C.C.

Mr. A. S. Campbell, who is temporarily engaged as resident engineer on the electrification of the L.C.C. tramways at the rate of pay of £8 per week, and who has been in the service for five years, is to be placed on the permanent staff in the position of principal assistant in the engineer's department at a salary of £425 per annum.

**General.**—Mr. J. Douglas Collier, who was, until recently, connected with the contract department of Messrs. Bruce Peebles & Co., Ltd., of Edinburgh, has joined Messrs. L. J. Healing & Co., of Yokohama, and is now on his way to Japan.

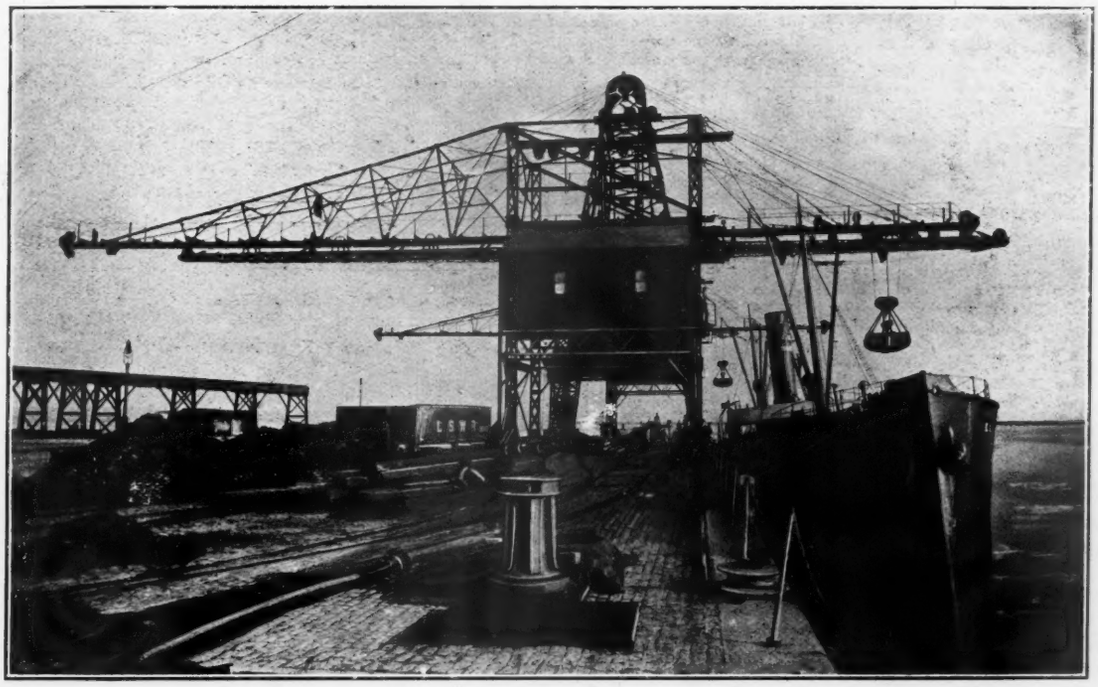
According to reports in the newspapers, Mr. T. A. Edison was operated upon on Monday for mastoiditis—inflammation in the mastoid, the large mass of bone which can be felt immediately behind the ear.

Mr. Ian W. Massie was presented with a dressing case by the employés of Messrs. Mavor & Coulson, of Glasgow, on the occasion of his leaving to take up an appointment as electrical engineer with the Rangoon Electric Tramways and Supply Co., Ltd.

The *British Australasian* says that prior to leaving Australia, Mr. Merz, who went out to report for the Government on the proposed electrification of the Melbourne suburban railway system, expressed the view that Melbourne, with its immense seaside and suburban traffic, offered an ideal opportunity for producing the best results from electric transit. The report will be ready in about three months.

## TEMPERLEY GRAB TRANSPORTERS AT THE NEW ADMIRALTY COALING PIER AT PORTLAND.

There has recently been put into operation at the Admiralty's new coaling pier at Portland an extensive installation of grab transporters, provided by the Temperley Transporter Co., lately amalgamated with Messrs. Applebys, Ltd., of Glasgow, Leicester, and London. Each of these transporters consists of a steel tower, mounted on wheels adapted to travel on two rails laid to a gauge of 29 ft. centres. The tower carries two arms, forming a continuous overhead track upon which the traveller runs, the total transporting distance being 132 ft. The in-board arm is fixed, and has an outreach of 85 ft., and the out-board arm hinges up, and has an out-reach of 47 ft., from the centre of the tower in each case.



Temperley Transporters on the Admiralty Coaling Pier, Portland.

The transporter can be used with grabs, buckets, or slings, and the change from one to another can be quickly made. The in-board portion of the transporter can be operated while the out-board arm is hinged up.

The tower is constructed so as to allow of the passage of locomotives or vehicles under it, and is mounted on eight double flanged cast-steel wheels, of about 3 ft. diameter. Two pairs of wheels are coupled together and driven by steel stud chains and pinions having machine cut teeth. The overhead track is formed of two strong channel sections placed with their webs outwards and flanges facing each other at a clear distance apart of about 12 in.; the inside of the lower flanges carries the traveller wheels. The raising of the hinged outboard arm is done by means of a steel wire-rope operating through a double purchase block, and coiling on a drum arranged to be driven by the motor which also moves the tower on the rails. The whole of the motors and operating machinery are contained in a house on one side of the tower, and controlled from an operator's platform, projecting from the upper portion of the machinery house, in such a position that he has an excellent view of the scene of operations. The body of the traveller, which carries the grab hoisting ropes, is articulated to the wheel bearers so as to allow it to swing sideways to a considerable extent without strain, and without lifting the wheels off the track on one side. A long shuttle, for operating the rope carriers, is mounted on the upper edge of the traveller, and from its ends are hung additional supporting rollers for the grab ropes and chains. The grabs have plain digging edges without tires, so that they may be used without damaging the bottom of a hold. The grabs are of the two-rope type; the second hoisting rope, instead of being directly attached to the head of the grab, passes round sheaves in the head, and is carried up again and anchored to the traveller frame, thus securing a double purchase when lifting. This arrangement of ropes is so designed, that spinning or twisting of the grab is prevented, and, when digging, the grab is always landed on the coal in the same direction in the trench which is dug, and, therefore, in the best position for filling itself. The capacity of a grab is about 55 cb. ft., and it has been proved capable of digging about 1 ton of Welsh coal under normal conditions. Special buckets may be used in place of the grabs, and by means of mechanism for working the latter, can be tipped in any position at the will of the operator.

The traveller is moved to and fro on the overhead track by means of an independent electric winch; the ropes are coiled on a drum, and one led round each end of the transporter arms to the traveller. The winch is fitted with powerful brakes, operating automatically, and arranged to be immediately applied in case of failure of current. The operations of lifting, lowering, opening and closing the grab are performed by two ropes led from two separate drums in the hoisting winch. The winch drums are driven through an epicyclic balancing gear of special design mounted on an intermediate shaft in such a manner that when the grab is suspended, both of the ropes are under an equal strain, and as one of the ropes acts on the grab through a double purchase, there are three ropes bearing the load. The two hoisting ropes are led round opposite ends of the transporter arms and then over the sheaves in the traveller to the grab. Owing to this arrangement, each of the hoisting ropes bears a strain of only one-third of the suspended load, and the stresses on the rope sheaves and the structure generally are

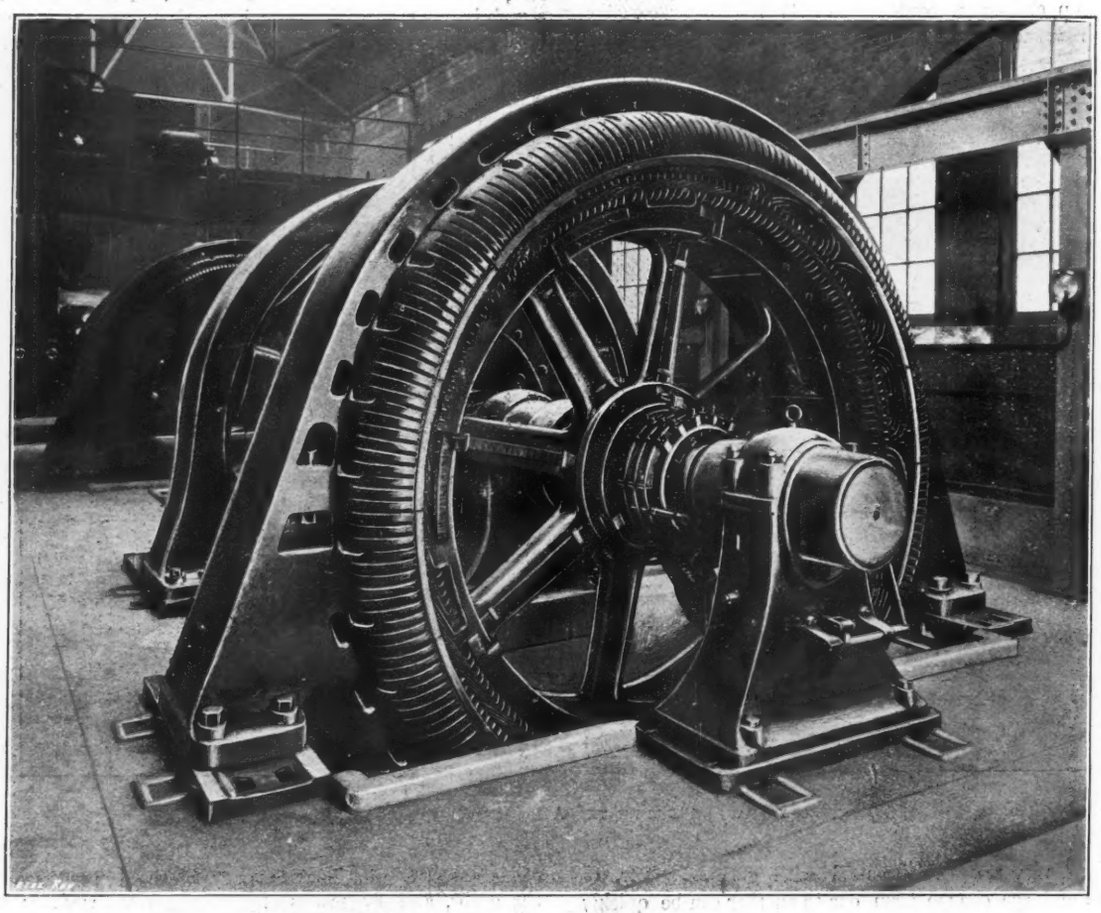
correspondingly small. This is a special feature of the transporter.

While the traveller is being moved along the track, the hoisting rope lead to the end of the rear arm is drawn out, and, uncoiling from the drum, rotates the other drum through the epicyclic gear, and, therefore, takes in the slack of the hoisting rope led to the end of the forward arm. During this process the height of the suspended load remains constant, unless intentionally varied by the operator. The epicyclic gear also enables one of the hoisting ropes to be held and thus suspend the grab at any height while the other rope is operated to open and close it. All motions are regulated by the motor controllers alone, and while the grabs or loads are in motion no other levers have to be operated. An auxiliary lever and pedal are fitted for controlling the opening and closing mechanism of the grab.

## LARGE INDUCTION MOTOR-GENERATORS FOR THE L.C.C.

We illustrate on this page, two 1,500-kw. induction motor-generators, supplied by Messrs. Dick, Kerr & Co., Ltd., for the London County Council Tramways, and installed in the Elephant and Castle sub-station.

Each of the machines has an output of 1,500 kw. at 500-550 volts d.c., and any speed from 133 to 135 r.p.m., and can carry 25 per cent. overload continuously for one hour. The induction motors are of the wound rotor type, with slip-rings for inserting the starting resistance, the stator being wound for the full normal pressure of 6,600



Dick, Kerr 1,500-kw. Induction Motor-Generators in the Elephant & Castle L.C.C. Tramways Sub-Station.

The motors are, for hoisting, one 60-b.h.p., series-wound, speed 700 r.p.m.; transporting, one 50-b.h.p., series-wound, speed 700 r.p.m.; travelling the tower or raising the hinged outboard arm, one 15-b.h.p., series wound, speed 900 r.p.m. Each motor is fitted with a controller of the tramway type; power is supplied through a double-armoured portable cable, 50 ft. in length, a double-pole plug box being provided for connecting to the mains on the jetty. The ends of the portable leads are arranged so that they cannot be accidentally drawn out of the plug box when in use.

The transporter is guaranteed to discharge by means of a grab, in a period of four hours, at least 200 tons of Welsh coal of ordinary Admiralty quality, from the hold of a collier and distribute it over from 75 ft. to 85 ft. from the centre of the tower. It is of interest to note that, in the course of recent official trials, some of these machines dealt with no less than 220 tons, and the others with 208 tons in the four hours, the driver in each instance being an inexperienced man.

volts between the three phases, and a frequency of 25 cycles per second.

The induction motor stator consists of a heavy cast-iron ring in one piece, separate from the base-plate to which it is bolted by turned and fitted bolts. The core plates are thin steel punchings, re-annealed after punching, and are securely clamped between end plates and drawn up by heavy bolts.

Ventilating spaces are provided along the length of the stator core, corresponding to similar spaces in the rotor core. The stator windings are enclosed in micanite troughs, the external loops being taped and finally finished over with varnished cord. These loops are protected from mechanical injury by ventilated cast-iron guards.

The rotor is built up on a solid spider of cast-steel, keyed to the shaft, the core being made up of thin steel stampings, ventilated throughout its length, and well clamped together by end plates.

The motor is started up with full voltage on the stator,

resistance being inserted in the rotor circuit by means of slip-rings, which are short-circuited when the machine has run up to speed.

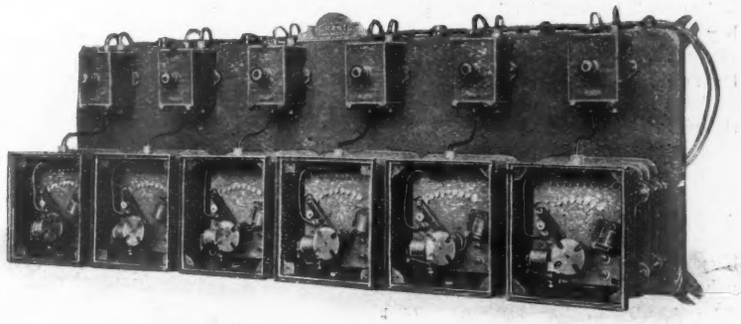
These motor-generator sets are of interest, from the fact that they are the largest of their kind that have been supplied in Great Britain.

## NOTES ON THE ADAMS MANUFACTURING CO.'S WORKS.

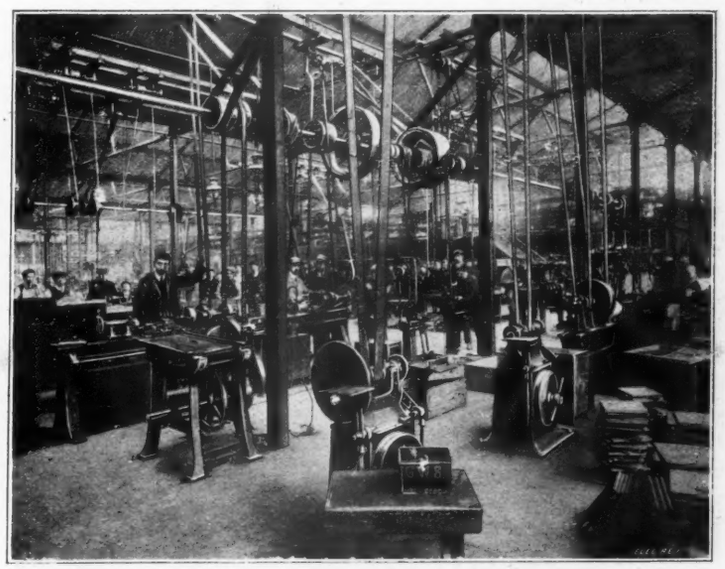
It is not very long since this enterprising company moved to the old-world town of Bedford, where its present works are situated. Prior to that move the firm had been carrying on an extensive manufacturing business at Sumner Street, Southwark, which, however, developed at such a pace as to necessitate the obtaining of larger workshops. With this end in view, the Adams Manufacturing Co. appointed a constructional staff at Bedford, and erected in record time a modern specialised rheostat factory. The most up-to-date machinery was installed, and the workshops are light, well ventilated and pleasantly situated.

Through the courtesy of the company, we are able to illustrate the interior of the works, which may be said to specialise in the well-known "Igranic" switchgear for the control of motors, &c., and in the production of the "Adams" motor-car. The company's standard practice is to use Igranicised slates for all its switch bases, these being plain rubbed slates impregnated with a special compound.

The Adams Manufacturing Co. is more particularly known, however, for its ingenious contrivances for the automatic starting and regulating of electric motors. These rheostats cover a large range of uses, and include lift controllers, either for rope or switch-operated motors, automatic starters for pumps, compressors, accumulators, &c., all of which are specially designed for the particular work to which they are allotted.



Adams Water-tight Motor Control Panel, with Controller Covers Removed.



View in the Adams Manufacturing Co.'s Works, Bedford.

This automatic apparatus is deserving of careful attention on the part of everyone interested in motor control, reducing, as it does, the risk run with manually operated switches, and at the same time doing the work in a more effective way, and saving the cost of the man's time.

Wherever it is deemed advisable, contact is made on carbon points, in order to reduce the liability to sparking, and the rheostats are also amply provided with no-volt and overload release coils, which, when called into play, immediately de-energise the hold-on coils of the contact levers.

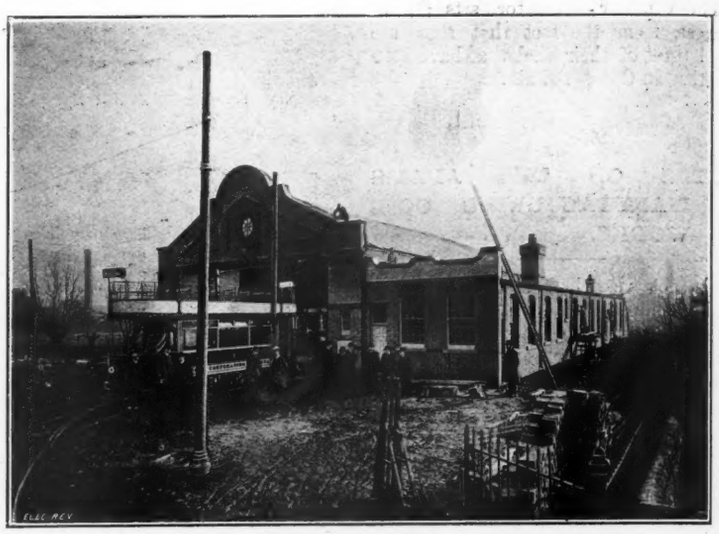
The company has recently introduced a new iron-clad type of speed-regulating resistance, in which the resistance is entirely enclosed in a cast-iron casing, fitted with gills. In this type of resistance, the air never comes into contact with the resistance material at all, but only with the outer surface of the cast-iron case. As a consequence, this resistance may safely be installed in positions which are not only damp, but positively wet, and this makes it peculiarly suitable for colliery work, or for breweries and mineral water factories, as well as for use on shipboard.

Luton Tramways: Constructional Work near the Corn Exchange.

We illustrate a six-motor controlling panel, which has recently been supplied for use in the bottling store of a large brewery, thus being a place where, as everybody knows,

water is even more plentiful than in other parts of a brewery.

The switch is contained in a cast-iron box, which is provided with glands through which the cable connections are made, while the resistance is mounted behind the switch-box, and enclosed in gilled cast-iron plates as described previously; it will be noted that the covers of the controllers and hand wheels are removed in the view.

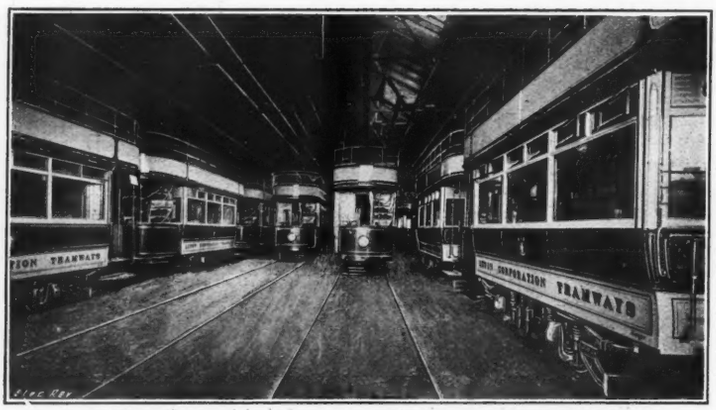


Luton Tramways: The New Car Depot.

## LUTON'S NEW TRAMWAYS.

The town of Luton, together with its neighbour Dunstable, has been associated with the straw hat trade for several hundred years. With the introduction of railway facilities it developed both in population and commercial prosperity, one of the most prominent signs of progress being the establishment of a public electric supply department, which was opened by the late Lord Kelvin in July, 1901.

Almost naturally this was followed by several propositions for electric tramways in the town, the most prominent of which was the Luton, Dunstable and District Light Railway scheme, which was eventually withdrawn. In 1903 a Corporation scheme for the construction of about four miles of tramways within the borough was put forward, and several offers for the construction and working of the lines were obtained, but after consideration the Corporation decided itself to apply for a Provisional Order for the construction of tramways, which was granted in 1905.




Luton Tramways: Interior of the Shed, showing Cars.

The Corporation Generating Station, Luton.

After further delay, negotiations were entered into with Messrs. J. G. White & Co., which ended in that company submitting an offer to the Tramways Committee to construct, equip and lease the tramways for a period of five or fifteen years at the option of the Council, the Corporation providing the capital and Messrs. White paying rent equivalent to the interest and sinking fund charges during the term of the lease. This offer was accepted by the Council, which has since expended some £63,000 on the carrying out of the scheme.

The latter embraces 5¼ miles of route, constructed to a gauge of 4 ft. 8½ in., on the familiar overhead trolley system, together with a car shed, 12 double-deck cars, and the necessary feeder cables, &c.

The rails, which weigh 95 to 101 lb. per yard, and are in 45 ft. lengths, were supplied by the North-Eastern Steel Co., and are laid on standard concrete foundations. Continuous rail joints are employed for track jointing, and intermediate anchors, spaced 5 yards apart.

The special work was constructed by Messrs. White, with points and crossings of Messrs. Edgar Allen's make, and the paving includes sections of both granite and wood block.

Side-bracket arm construction has been employed throughout in connection with the overhead work, with British Standard poles of 700, 900 and 1,100 lb. weight, and side arms of 8 to 16 ft. length.

The trolley wire is of the grooved type, 2/0 B. & S. gauge, supported by gun-metal mechanical ears varying from 6 in. to 18 in. in length.

Guard wire of 7/16 galvanised steel is employed where

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necessary, and in such cases every fifth pole is bonded to the track.

Rather over a mile of feeder cable has been laid in connection with the tramway routes, supplying the overhead work through feeder pillars and section boxes of Messrs. Estler's make.

The cars were supplied by the B.T.-H. Co., as sub-contractors, and include bodies of the United Electric Car Co.'s make, mounted on single trucks supplied by Messrs. Mountain & Gibson. Each car is equipped with two 30-H.P. B.T.-H. motors and the same company's control gear, &c.; a swivelling trolley arm; Hudson & Bowring lifeguards; illuminated destination signs; and is lighted by 12 16-C.P. lamps. The car-shed will accommodate 16 cars on its four tracks, and is provided with suitable repair plant, stores, &c.

The population served by the tramways, which were opened on the 21st inst., is approximately 40,000, and the routes comparatively easy with the exception of a fairly long gradient of 1 in 14½.

The tramways power supply is, of course, obtained from the Corporation's generating station, which, as then existing, was fully described in the ELECTRICAL REVIEW of August 23rd, 1901. For the purposes of the tramway, one of the 85-KW. Allen generators, then described, has been fitted with change-over switches, and works in conjunction with a D.P. traction battery and L.D.M. reversible booster recently installed for the purpose.

Further, a traction switchboard, of Messrs. Johnson and Phillips' make, has been added to the original board. Since our description appeared, the gradual development of the lighting and power load has necessitated further additions on that account alone, these including two Allen steam dynamos of 350 KW. and 500 KW. capacity respectively, and further acquisitions in boiler plant for the increased steam supply.

In connection with these extensions an additional 45 ft. has been added to both engine and boiler houses, and a complete coal-handling plant with overhead bunkers and conveyors has been installed. Among other items added which contribute to bring the plant up to date, may be mentioned Worthington condensing plant, a "Sinclair" feed pump, Bennis compressed air stokers, and a Harris-Anderson water purifier. The capacity of the station is now 1,147 KW.

The borough electrical engineer (Mr. W. H. Cooke) and the borough engineer acted as joint engineers to both the tramway scheme and the extension to the generating station, the electrical engineer being responsible for the design and plant extensions in the latter case. In conclusion, we are indebted to Mr. T. G. Hobbs, F.R.G.S., of Luton, for the use of his photos for illustrative purposes.

## NEW COMPANIES REGISTERED.

**J. Bonn & Co., Ltd.** (96,902).—This company was registered on February 19th, with a capital of £1,500 in £1 shares, to take over the business of engineers, mechanical and electrical instrument and appliance manufacturers and model makers, carried by J. Bonn, at 97, New Oxford Street, and 9, Lawrence Street, High Street, Bloomsbury, W.C., as "J. Bonn and Co." The first subscribers (each with one share) are:—J. Bonn, 79, New Oxford Street, W.C., engineer; A. E. Jones, Hailstone, Honeybourne Road, East Hampstead, N.W., engineer; Mrs. B. Bonn, 34, Alexandra Road, Finsbury, N.; Mrs. S. Jones, Hailstone Road, Honeybourne Road, East Hampstead, N.W.; F. Mawer, 139, Gt. Russell Street, W.C., mechanic; W. H. Woodall, 10, Dock Lane, Dudley, clerk; and J. P. Whitehorn, 120, Ivanhoe Street, Dudley, clerk. No initial public issue. Registered without articles of association. The first directors are J. Bonn and A. E. Jones. Registered offices, 97, New Oxford Street, W.C.

**Addinell & Co., Ltd.** (96,825).—This company was registered on February 13th, with a capital of £1,500 in £1 shares, to take over the business of an electrical engineer and contractor carried on by J. G. Addinell at Saracen Buildings, Snow Hill, E.C., as the A.C. Electrical Co., and at Eagle House, Great Darkgate Street, Aberystwyth, Cardiganshire, as Addinell and Humphreys, and to adopt an agreement with the said vendor. The first subscribers (each with one share) are:—R. S. Phillips, 1, Albany Road, West Green, N., traveller; R. E. Burnage, jun., 19, Queenswood Avenue, Muswell Hill, traveller; J. J. McIntyre, "Caithness," Muswell Hill, N., solicitor; J. G. Addinell, 24, King's Avenue, Muswell Hill, N., engineer; G. H. Palmer, Stamford, Crowston Road, Westcliffe-on-Sea, electrical engineer; A. E. Timberlake, 4, Terra Cotta Terrace, Lower Edmonton, electrician; and P. H. McIntyre, "Caithness," Alexandra Park Road, Muswell Hill, gentleman. No initial public issue. The number of directors is not to be less than two or more than five; the first are J. G. Addinell and P. J. McIntyre; qualification, £10; remuneration as fixed by the board. Registered office, Saracen Buildings, Snow Hill, E.C.

**Colonial Rail and Tramway Syndicate, Ltd.** (96,849).—This company was registered on February 14th, with a capital of £2,100 in 2,000 "A" shares of £1 each and 2,000 "B" shares of 1s. each, to contract, work, develop or control railways, tramways, and other public works and conveniences of all kinds in any British Colony, Dependency or elsewhere, and to carry on the business of financiers, capitalists, company promoters, concessionaires, &c. The first subscribers (each with one "A" share) are:—W. H. Hodges, 87, Glengarry Road, Dulwich, S.E. secretary; F. W. Gibson, 27, New Cross Road, New Cross, S.E., theatrical manager; E. H. Burton, 15, St. Helen's Place, E.C., F.C.A.; A. H. Lansdone, 96, Lillington Street, Westminster, clerk; D. Lewes, 285, Winchester House, Old Broad Street, E.C., mining engineer; G. Brodie, 42, Copthall Avenue, E.C. broker; and P. J. Miller, 31, Lombard Street, E.C., solicitor. No initial public issue. The subscribers are to appoint the first managers. Registered office, 15, St. Helen's Place, E.C.

**British Magneto Co., Ltd.** (66,927).—This company was registered on February 13th, with a capital of £1,000 in £1 shares to carry on the business of electricians, manufacturers of and dealers in and agents for the sale of all kinds of electrical apparatus for motor-cars or otherwise, motor ignition devices and electrical accumulators, motor-cars and boats, &c. The first subscribers (each with one share) are:—T. Longmore, 123, Cox Street, Coventry, clerk; J. Davies, 38, King Richard Street, Coventry, accountant; A. H. Jarrard, 70, Swanswell Street, Coventry, clerk; W. Harrad, 13, Charterhouse Road, Coventry, clerk; W. Coleman, 52, Homer Street, Birmingham, clerk; H. W. S. Grimes, Crosslands, Whitley, Coventry, solicitor; and R. J. Sawers, Coventry, solicitor. No initial public issue. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification, £100; remuneration as fixed by the company.

## CITY NOTES.

### Notting Hill Electric Lighting Co., Ltd.

THIS company's meeting was held on Tuesday at 140, High Street, Notting Hill, Sir W. Crookes, F.R.S., presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, February 21st, page 321), said that that meeting witnessed the majority of the company, they having been in existence 21 years, and he has had the pleasure of presiding over all their meetings except one. The share capital and loan accounts showed no alteration, there having been no issue of capital since 1903. The expenditure was £25,526 in excess of the capital received, and that was accounted for by their drawing on their reserve fund, which now stood at £25,531. They thought that it was better to use their own reserve in developing the business than to borrow money, considering the state of the financial market. There was only a small increase in the capital account of £2,168, which was principally due to new mains. However, that account represented the growth of their business, as the greater the capital expenditure for mains, &c., the more consumers were been connected. The revenue showed an increase of £1,000, but unfortunately the expenses of production having increased by about £2,000, the balance of the profit was reduced by £1,000. The reduction in the net profit was more than accounted for by the increased costs at the Wood Lane works during the latter half of the year. Firstly, to the increased price of coal; and, secondly, to the cost of the exceptionally heavy repairs which had had to be carried on at that station under most unfavourable circumstances. The rates paid with respect to the company's business—£3,475—was equal to a dividend of 2½ per cent. on the share capital. They had spent about £1,300 on the Wood Lane station, and the works being now in good order, he thought the expenses for that station would show a considerable reduction for the current year, and they might look forward to a proportionate increase in the profits. They had had to pay about 33 per cent. more for their coal this year, and had they had the benefits which they would have under their Bill, which they intended to promote this year, of being able to obtain current from their neighbouring companies, when the Wood Lane station failed them, they would have had a large profit to show. The net revenue account showed that they had received £19,007, and after placing £2,000 to depreciation and renewal fund and providing debenture interest and sinking fund in respect of Wood Lane, they had £11,500 to deal with, which was £1,100 less than last year. The depreciation and renewal account now stood at £27,531, and as they were now charging repairs to renewals, he hoped it would not be necessary to trench upon that fund to any great extent. Their proportion paid to the Kensington and Notting Hill joint debenture stock was £7,306. During the year they had generated 2,734,049 units, and they had sold nearly two million. Briefly, the year's work was that 2,673 houses had been connected to the mains; 160,349 lamps connected; units sold 1,913,055; profit £19,007, and the dividend on the shares 7 per cent. These figures brought to his mind the time when in 1887 a small syndicate first started the business, and now they had reached the figure of two million units sold and a revenue of £38,000. As to the future prospects of the company, the output for last month showed an increase over the corresponding period last year, and the working expenses were lower. The rates for current were charged low so as to compete successfully with the gas companies and they must remember that they only charged 1d. per unit for street lighting instead of 2½d., and thus the local authority were getting another benefit in addition to what they received in rates. They had entered into a very important contract, in connection with the Franco-British Exhibition. They had made arrangements to assist the Hammersmith Borough Council in supplying electricity to the exhibition, but the Council had to take not less than one million units between April and November. That would mean a very considerable reduction in the working expenses, during the summer, and therefore he anticipated a further rise in the profits and hoped that they would be able to recommend an increase to the rate of dividend next year.

SIR RICHARD B. MARTIN seconded the motion, and the report was adopted.

Subsequently an extraordinary general meeting was held to confirm a resolution passed on February 3rd, approving of the Bill for linking up the West End companies to enable them to give a bulk supply to that area.

The CHAIRMAN having briefly dealt with the clauses of the Bill *seriatim*, moved, "That the company approves of the Bill introduced into Parliament entitled a Bill to confer further powers upon the Kensington and Knightsbridge Electric Lighting Co., Ltd., the Notting Hill Electric Lighting Co., Ltd., the St. James' and Pall Mall Electric Lighting Co., Ltd., the Westminster Electric Supply Co., Ltd., and the Central Electric Supply Co., Ltd., with respect to the supply of electrical energy and for other purposes."

MR. THOMAS J. JERVIS seconded the resolution, and it was agreed to.

## Kensington and Knightsbridge Electric Lighting Co., Ltd.

THE directors report that during 1907 the number of houses and shops connected with the system has increased from 3,977 on December 31st, 1906, to 4,172 on December 31st, 1907, while the number of lamps calculated on the usual basis of 8 C.P. has increased from 353,532 (10,600 KW.) to 383,200 (11,500 KW.). The renewal account now stands at £69,602, being an increase of £3,224. After providing for the amount placed to renewal account, and after paying the dividends on the 6 per cent. first preference shares to June 30th, 1907, on the 5 per cent. second preference shares to September 30th, 1907, and an interim dividend at the rate of 10 per cent. per annum on the ordinary shares for the first half of the year, the balance standing to the credit of the net revenue account for the year 1907, is £9,854. The directors draw attention to the fact that the rate of dividend has been maintained, despite the high price of coal and the large amount paid in respect of local taxation, which latter item alone now amounts to a sum equivalent to about 6 per cent. on the ordinary shares. Although the company pay this large sum towards the rates, it has no voice in deciding as to its application. Of the above sum £1,500 has been appropriated to the payment of the first preference dividend to the end of the year, and £625 has to be set aside to meet the portion of the dividend on the second preference shares accrued to the same date. It is proposed to pay out of the balance of £7,729 a further dividend on the ordinary shares at the rate of 10 per cent. per annum, for the past half-year, making with the interim dividend paid on August 1st, 10 per cent. for the year. This will leave a balance of £2,479 to be carried forward. After the general meeting (yesterday) there was to be held an extraordinary general meeting for the purpose of confirming the resolution passed on 6th inst., relative to the Bill now being promoted by this company in conjunction with four of the other electric supply companies in London.

## Chatham and District Light Railways Co.

THE working during the half-year ended December 31st, 1907, has resulted in receipts amounting to £20,208, and expenses £12,800, less interest on debentures £1,234, and less amount written off as per revenue account £5,555, leaving £619, plus balance brought forward from June 30th, 1907, £4,493, making £5,112. Of this amount £3,000 has been transferred to reserve for depreciation; £1,764 is devoted to dividend at the rate of 3 per cent. per annum on the preference shares for the half-year, and £348 is carried to revenue new account. Owing to the bad weather experienced throughout the year, and slackness of trade in the Chatham district, the traffic revenue has been very disappointing, there being an increase of only £1,580 over the previous year's receipts, although the Rainham extension was open for the full year as compared with three months of the year 1906. During the half-year £1,900 debentures and £1,900 preference shares have been issued, and the proceeds utilised in reducing the company's indebtedness. Capital expenditure during the half-year amounts to £2,060, mainly expended on additional plant in the power station. In September last the Board of Trade issued, on the application of the Gillingham Corporation, an order declaring that the powers of the company in respect to the lines in Pier Road (1,246 yd. in length) should cease and determine. The cost of the line and reinstating the roadway, less materials taken up, amounts to £4,528, and the directors in the circumstances have considered it advisable to write the full amount off in the attached accounts, and the balance cost of the line abandoned in Westcourt Street, viz., £666, and recommend that the balance profit, after transferring £3,000 to reserve for depreciation, be utilised in paying a dividend at the rate of 3 per cent. per annum for the half-year on the preference share capital, carrying the balance of £348 to the accounts for the current year. The Rochester Corporation extension lines to Strood Hill and Frindsbury, referred to in the previous report, are expected to be completed before Easter and leased to the company.

The meeting is to be held on March 5th.

## Lancashire United Tramways Co., Ltd.

THE directors report that the profit for the past year amounts to £12,789, and after payment of the prior lien debenture stock interest, there is a balance of £259. This amount, together with the credit balance in net revenue account brought forward from last year, has been written off the loss on the sale of motor-buses. The following is a summary of the operations of the various electric tramways (other than the St. Helens Tramways) comprised in this company's system, worked out as though one undertaking:—Traffic receipts, £66,605; miscellaneous receipts, £2,744—total, £69,349; less working expenses, £45,716. General charges (including direction, management, interest, &c.), £6,104; rent of leased lines, &c., £4,679, leaving a profit of £12,860. The receipts per car-mile, although only 7·56d., are higher than in any previous year, and this figure has been steadily increasing from 6·73d. in the first year (1903·4) to the present figure of 7·56d. For the year ending June 30th last the working of the New St. Helens and District Tramways Co., Ltd. (in which this company has a preponderating holding) resulted in a profit, but it was not possible to distribute any of this by way of dividend, owing to the adverse balance in profit and loss account from the trading of previous years. This adverse balance is, however, almost extinguished. The total track mileage controlled by this company (including the St. Helens tramways) is 74 miles. Last year was a particularly unfortunate one for tramways because of the wet summer, and the company has suffered severely in this respect owing to the inter-urban character of its system. Still, since October last, the receipts show increases of about £400 a month on the previous year. The company have introduced a comprehensive scheme of short-distance return fares for workmen, and the number of persons carried last month was 295,693 as against 174,825 in January last year, with results satisfactory to the company.

## Newcastle and District Electric Lighting Co., Ltd.

THE directors report that during 1907 9,282,370 units were sold, as against 8,076,770 in 1906, an increase of 14·92 per cent. The increase has not been in proportion to the estimate which was formed in the beginning of 1907, due to the falling off in the demand for electrical energy for power and other purposes in the engineering and other trades, owing to lessened work; and this, combined with the increased cost of coal, has had a depreciatory effect upon the anticipated profits for the year. The gross profits for the year for Newcastle amount to £18,502, and for Newburn to £857; £2,248 was brought forward from last year. The total is £21,616. After deducting directors' and trustees' fees, income-tax, &c., and making provision for leasehold redemption fund, there remains a net balance of £19,923. After providing for all interest on debenture stock, &c., the directors recommend a dividend at the rate of 4 per cent. per annum for the half-year ended December 31st, less income-tax, which, together with the interim dividend paid in August last, makes 4 per cent. for the year. To accomplish this it will be necessary to draw upon the reserve fund to the amount of £1,222. The directors, however, feel justified in recommending this in view of the abnormal price of coal and other circumstances mentioned above, more especially with respect to the establishment at Newburn, which, according to the accounts, cost the sum of £71,245, with a return for the year of only £857; a very small percentage on the capital expended. There is every reason to hope that in the future the return from the Newburn station will be much improved as the load increases. Further, an arrangement has recently been made with Messrs. John Spencer & Sons, Ltd., for a term of years to utilise their exhaust steam, and thus "the current" will be produced at a very low rate, which will assist the profits of the station considerably during this and future years. From these circumstances, and from possible economies generally being effected in various ways, and with the anticipated reduction in the price of coal, the company's position during the current year will, the directors confidently feel, be much improved. The directors regret the death of Sir John D. Milburn, Bart., who had been the chairman of the company since its inception. During the year Mr. Frank R. Simpson has been elected to the board.

The annual meeting was held on the 25th inst. MR. JOHN B. SIMPSON, who presided, spoke of the great loss the company had sustained in the death of the late chairman, Sir John D. Milburn, Bart. In regard to the prospects of the company, the profit was not what had been anticipated, owing to the abnormal price of coal, and the slackness of work in certain trades on the Tyne. He expressed a hope, however, that the results of the company's working this year would show to better advantage.

A dividend was declared at the rate of 4 per cent. per annum for the half-year. A donation of £50 was voted to the Armstrong College, and £21 to the Royal Victoria Infirmary. The retiring directors were re-elected, and Mr. R. Simpson was also elected a member of the board. The chairman announced that Sir Charles S. Milburn, Bart., had been invited, and had agreed to accept a seat on the board. The retiring auditors were also re-elected.

**Ascot District Gas and Electricity Co.**—The report for the half-year ended December 31st states that there is a loss of £14 on the electricity account.

**The Electrical Development Company of Ontario.**—A Reuter telegram from Ottawa says that Mr. William Mackenzie, president of the Canadian Northern Railway, has secured control of the Electrical Development Co., bonds of which to the amount of $8,000,000 (£1,600,000), are held in Great Britain. It is officially declared that the reorganisation will result in the interest being met.

**France.**—La Société Industrielle des Telephones, of Paris, reports a profit of £71,127 for the last financial year, and is declaring a dividend of 16½ fr. per share.

## Scarborough Electric Supply Co., Ltd.

The annual meeting was held at Scarborough on the 20th inst., Mr. G. Alderson Smith, J.P., D.L., presiding.

The report stated that though there had been an increase in the amount of energy supplied during the year, the receipts had continued to be adversely affected by the depression of trade in the town, while the expenses had risen owing to the higher price of coal. The capital outlay during 1907 was £1,330 against £3,427 for 1906, the principal item of expenditure being for extension of mains. The accounts showed that after placing £750 to depreciation account, there was a balance on revenue account of £4,238. The directors recommended a dividend, which the meeting agreed to, of 4 per cent. for the year (free of income-tax), which absorbed £3,990, leaving £248 to be carried forward.

The Chairman, in moving the adoption of the report, detailed economies which had been effected during the year, but added that there were bad debts amounting to £212, against £75 in the previous year. However, they had placed to reserve on account of bad debts £320, so that they were on the right side. He regretted that the Corporation had not come to terms with them in the efforts made by the Corporation to get the Electric Supply Co. to destroy the town's refuse. The directors found that the cost varied in places from 1s. 6d. to 3s. per ton. They asked the Corporation for 2s. 6d., which evidently was considered too high.

Mr. G. L. Berforth, J.P., seconding the motion, said that it was a great pity the Corporation were going to launch into a large expenditure in putting up a destructor, because eventually they would, no doubt, have in their hands the electric supply undertaking, and, therefore, it was simply a waste of money.

In moving the resolution declaring a dividend of 4 per cent., the Chairman said the majority of the directors believed they were justified in paying this. Personally, he was of opinion that a 3 per cent. dividend would be preferable. He need not say anything more than that.

Mr. Harold Ellis, who last year succeeded, as a director of the company, his father (the Right Hon. J. E. Ellis, M.P.), in seconding, regretted that their managing director, Mr. A. A. Campbell Swinton, M.I.C.E., was unable to be present. He urged that they were justified in paying 4 per cent. They were convinced the company was now on the up-grade. The consumption of current was gradually growing. That year they showed an increase of 20,000 units on the lighting. As one interested in coal, he might say that there was an obvious decline in the trade, and he thought their coal bill would show a very distinctive decline. They based considerable hopes on the new lamps. These metal filament lamps were being gradually improved, and, no doubt, would very rapidly oust the carbon lamps from the market. They looked upon the new lamp as the gas company did on the incandescent mantle, and felt that it would prove a very good competitor to the gas mantle.

Mr. Alderson Smith and the Hon. C. A. Parsons were re-elected directors.

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## Chelsea Electricity Supply Co., Ltd.

The directors' report for 1907 states that the profit amounts to £33,099, which with £1,092 brought forward and £451 balance of interest, makes a total of £34,643.

After deducting interest on debenture stock, £7,875, interim dividend, 6 per cent., on preference shares, £900, and interim dividend on ordinary shares at the rate of 4 per cent. per annum, £4,944, there remains £20,924, which is to be appropriated as follows:—To renewals and depreciation fund, £11,619; to debenture stock premium redemption fund, £519; to amount written off cost of extinction of founders' shares, £802; to final dividend on the preference shares at the rate of 6 per cent. per annum, making 6 per cent. for the year, £900; to final dividend on the ordinary shares at the rate of 5 per cent. per annum, making 4½ per cent. for the year, £6,179; leaving £905 to be carried forward.

The number of 8-c.p. lamp equivalents connected on December 31st, 1907, was 240,735, an addition of 7,430 during the year, and the total number of units sold was 3,548,628, being 240,914 more than the previous year. A Bill in Parliament is again being promoted to give London electrical supply companies powers of association, which, if granted, should effect economies in the cost of production and enable them to deal satisfactorily with the question of bulk supply.

The directors record the death of their colleague, Mr. William Page. The vacancy has been filled, subject to the confirmation of the shareholders, by the election of Mr. Henry Ramié Beeton, who has been chairman of the Brompton and Kensington Electricity Supply Co. Ltd., from the commencement.

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## Great Northern, Piccadilly and Brompton Railway Co.

Sir Geo. S. Gibb presided at this company's meeting, held last week at Hamilton House. In moving the adoption of the report (see Electrical Review, February 14th, page 277), he said that they had now just completed the first year of working, and consequently they could not make any comparisons beyond that for the first seven weeks of the year 1908. The published receipts showed £585 per mile of way this year, as compared with £410 last year, or an increase of about 43 per cent. Their earnings worked out at an average of 1·98d. per passenger. They were enabled to pay the full 4 per cent. dividend on the whole of the shares held by the public. The Underground Co. and their nominees held the balance and they had waived any right to share in the dividend. The chairman then went in considerable detail into the agreement which was to be submitted for approval at the meeting. The construction period having ended they had been engaged in settling outstanding questions as between themselves and the Underground Co. The Underground Co. received under the contract the whole capital of the company in consideration of the execution of the works comprised in the construction contracts. Of course a great many changes were made during the construction, and the result was that there were certain outstanding questions and claims on either side. The main points in regard to these were then referred to. The result of all the various mutual claims showed that if they were all settled on a cash basis on either side the amounts would approximately balance each other. Therefore they thought that the best plan was to have an agreement for the mutual cancelling of the claims. Of course the Underground or their nominees held all the shares except about 35,000 odd which were to be converted into preference shares. The chairman, after further remarks, moved first a resolution approving the agreement because the accounts depended upon its provisions.

Lord George Hamilton seconded the motion and it was carried. The report was next adopted and the dividend resolution passed, paying on February 25th, 4 per cent. on 35,704 ordinary shares.

Sir Algernon West was elected a director, and the retiring directors and auditors were re-elected.

The meeting then became special and passed a resolution approving of the Bill now pending in the House of Lords for conferring further powers as to capital and other purposes.

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## Yorkshire Electric Power Co.

The half-yearly meeting, held at Leeds on February 17th, was presided over by Mr. A. G. Lupton, M.P., who, in moving the adoption of the report (see Electrical Review, February 7th, page 231), said that they had spent £3,746 during the six months on mains extensions and service equipments to supply consumers in the new districts thus met. The increased coal bill was due to greater supply of current and to the abnormal rise in coal prices. The revenue account showed an increase of 40 per cent., and there was a profit of £836, compared with a loss of £403—an actual improvement of £1,239. The net revenue account showed a loss of £139, against a loss of £1,211 for the previous half. At the meeting in February, 1907, he ventured to prophesy that the company would be earning the whole of its costs by the end of the year, and it was satisfactory to find this prophecy had proved correct, and that the excellent service provided by the company was rapidly winning the confidence of power-users. Probably one of the most significant changes since then had taken place in regard to the textile industry. Four years ago the use of electricity for textile purposes was so small as to be practically negligible, but to-day there were districts where entire mills were run electrically. When the company first started operations, representations as to the utility and saving to be effected by the use of electricity for power purposes on a large scale were listened to with scant sympathy or open unbelief. Now the company had succeeded in convincing power-users of every description of the advantages to be derived from the use of energy taken from its mains. One very satisfactory feature was that nearly all their consumers had connected, or arranged to connect, more motors to their system than they originally agreed upon—the best evidence and proof of the value of the supply and its continued use. A determined effort was being made to attract new consumers into the district. The mains were laid in districts pre-eminently suitable for electric power users. Low rates, excellent canal and railway facilities, and the Power Co.'s supply, offered every attraction, and shareholders should influence anyone they could in that direction, and (especially in view of the change in the patent laws) any foreign manufacturers who might be considering the erection of works in England. Particulars of vacant land, rates, water charges, &c., would be given upon application. Another serious difficulty that the company had to contend with at the first was the hostility of local authorities in the district. This opposition to the company's Act had resulted in a clause by which the company could not supply current in the district of a local authority who had taken out lighting orders, and before the company first commenced its supply a large number of districts (24) were covered by local authorities who were not themselves in a position to give a supply, but were by this clause able to prevent the company doing so without their consent. That feeling of opposition had largely passed away. The revenue which the company already derived from the supply of electricity to local authorities for them to distribute was growing fast. They had realised that the company could help them quite as much as they could assist the company, and the time was rapidly coming when the local authorities would urge the company to bring its benefits into their district in place of the rigid policy of exclusion which they at first pursued. In the past the company had had to spend considerable sums in protecting its area from attacks made by local authorities asking for powers, which, whenever the question had come before Committees of Parliament, had been refused. In the present Parliamentary session there was only one Bill which the directors found it necessary to oppose. To many of them the time of waiting had been very tedious, but the company had had a new business to establish; it had had to break down considerable conservatism and unwillingness to take up new methods, which were, perhaps, among

the characteristics of Yorkshiremen; but the progress made was definite, and he believed the rate of progress would increase. They had had their anxious moments, but they felt that the company was now fairly started on its way towards success.

MR. T. CALLENDER seconded, and the report was unanimously adopted.

The resolution as to the report and accounts being issued annually instead of half-yearly was approved, it being understood that a report of progress would be forwarded to the shareholders half-yearly.

## Bruce Peebles & Co., Ltd.

IN Edinburgh, on Monday, an extraordinary general meeting of shareholders was held to consider the following resolution:—"That it has been proved to the satisfaction of this meeting that the company cannot, by reason of its liabilities, continue its business, and that it is advisable to wind up the same; and, accordingly, that the company be wound up voluntarily."

There was a very large attendance, the hall in Dowell's Rooms being so crowded that many of the shareholders had to stand throughout the proceedings. MR. W. CARMICHAEL PEEBLES was in the chair.

From the statement of affairs submitted by Mr. Andrew Wilson Tait, chartered accountant, London, the figures read:—

| ASSETS. | Dec. 31, 1907. | Dec. 31, 1906. |
|---|---|---|
| Buildings and works at East Pilton | £49,000 | £49,647 |
| Working plant and machinery, patent rights, trade marks, goodwill, &c. | 104,248 | 110,091 |
| Stock, stores, and completed work, and works in progress | 82,585 | 109,593 |
| Book debts and amounts due on current contracts | 128,669 | 301,572 |
| Cash in hand and in bank | 3,124 | 2,886 |
| Shares in power and traction companies | 115,777 | 51,920 |
| Special reserve fund investments | 11,937 | 7,718 |

| LIABILITIES. | Dec. 31, 1907. | Dec. 31, 1906. |
|---|---|---|
| Preference share capital | £150,000 | £150,000 |
| Ordinary shares | 141,905 | 141,905 |
| Debentures and interest accrued | 75,890 | 75,890 |
| Debts due by the company | 183,909 | 208,907 |
| Overdraft on Royal Bank | 32,589 | — |
| Special reserve | 11,556 | — |
| General reserve | 27,000 | — |

That statement showed the position at the end of December, 1907, compared with the end of December, 1906. The net loss, Mr. Tait said, after making provision for the clearing up of contracts still on hand and carried into the balance-sheet, was £131,228, and, if they deducted the general reserve fund and the special reserve fund, they got a net sum of £92 671.

The CHAIRMAN said that the difficulties the company had had to contend with during the past year might be summed up under the following heads:—

1. The need of further working capital for the carrying on of the business, accompanied by extreme stringency of the money markets.
2. For the same reason the stoppage of practically all new contract work.
3. The very high prices of raw materials.
4. The low price obtainable for the company's ordinary manufactures through undue competition.

Taking these *seriatim*, he reminded the shareholders of the authorisation to increase the borrowing powers to an amount not exceeding £200,000, but it was found that to raise money on a satisfactory basis was impossible at that time. Last year it was hoped to receive orders to proceed with the construction of several new tramways and other large enterprises, but owing to the condition of the money market these had all been delayed. In nearly all cases the price of raw material had been on a considerably higher basis than the company was paying in 1906, and particularly was this the case with reference to copper. The high price of copper adversely affected the company's profits. When the company was formed, the prices obtainable for its ordinary manufactures were nearly double what they are to-day. There had been a constant decline in prices, brought about first, by foreign competition when they had dumping from abroad, and, latterly, when the prices in this country had come down to such a level that the foreigner did not find it worth while to export, then by the continued competition among the home firms. But the company had some valuable specialities, which, while taking them away from this extreme competition, had cost large sums of money to perfect and introduce, and the benefits of which had only recently begun to tell. The directors had taken every possible step to reduce the costs of manufacture, and last year's results in this direction had been of a satisfactory nature. As regards the large Moscow tramway contract for the last few months, everything had been done by the directors to maintain the position of the company with the Moscow authorities, in order to secure that contract, which they had good reason to believe would have proved most profitable. At present the company held an option for the contract, and, notwithstanding its present position, it was hoped it would still benefit. The business connection and experience of the company was most valuable, and if they agreed to a scheme for reconstruction, there was a substantial future for it, and it might emerge from the crisis stronger than ever. They had had great confidence in the business, and no member of his family had sold a single share. Their (his family's) combined holdings were £78,000 in shares, and less than one-third of that was goodwill. He did not doubt that the shareholders would agree to the proposal for the appointment of Mr. Tait and Mr. Robertson-Durham as joint liquidators, and that those gentlemen would at once consider whether a scheme of reconstruction could be framed for the benefit of all concerned.

MR. TAIT, who spoke next, said that the heavy loss had arisen from a variety of causes. The particular contract where a certain system of traction was adopted, caused considerable expense and loss through the system proving unsatisfactory to the company and having to be replaced by another system. They had made considerable profits on other contracts. The company had spent considerable sums of money in the development of special lines and manufacture in their works, and there was reason to believe that considerable compensating advantage would accrue from them. In the electrical industry manufacturers were beginning to realise the need of coalition for the steadying of prices. Improvement in the electrical situation had started, and though gradual, yet in a few years the balance between production and supply should be adjusted, which should give reasonable profits to manufacturers. As regards the formation of the Electrical Securities Trust, approximately one-half was paid to the company in cash, and the balance in shares. The cash which they received enabled the company to clear itself of large financial responsibilities in connection with the contract he had mentioned. Later in the year certain shares in the Securities Trust were sold at prices which created a considerable book loss, but the company had the right to repurchase at prices which would redeem a considerable proportion of the loss if it was still advisable to do so. Final arrangements were completed for a sale of the gas department at a price which was considered satisfactory.

The motion having been put to the meeting, several shareholders asked many questions.

In reply to MR. C. J. SHIELS, Edinburgh, MR. TAIT said the amount of book debts in the figure £123,000 was £54,095, and the amount due on current contracts was £69,574. He also stated that the Electrical Securities Trust obtained securities on over £200,000.

MR. TAIT further said that the fullest particulars would be given before any scheme of reconstruction was put forward for adoption. A committee of shareholders would be appointed. They might take his assurance that there was a strong possibility of a scheme going through which would preserve the best interests of the shareholders. Their greatest guarantee was that the majority of the largest creditors were very much in sympathy with the position in which the company found themselves, and were willing, he believed, to support any scheme of reconstruction, which on submission of the figures to them would prove to be sound, and place the company in an absolutely independent position.

MR. TAIT further added that he was satisfied as an individual that a scheme was undoubtedly the best possible thing to do; he could not outline any scheme, as that would be compromising the position, but he believed some scheme would be put forward in the near future to the shareholders. A scheme would require first to be dealt with by the joint liquidators, and after the full approval of the creditors.

Asked when these financial difficulties began, MR. TAIT said they arose when the board could not place the debentures on which they were relying for working capital. That commenced a period of stringency in which the assets suffered. The Securities Trust was not formed until June, 1907.

MR. TAIT explained that his position in connection with the company was that of an ordinary director. There were four managing directors and two outside directors.

The resolution was carried unanimously.

The CHAIRMAN, seconded by MR. A. C. PEEBLES, moved that Mr. A. W. Tait and Mr. J. A. Robertson Durham be appointed joint liquidators. There was an amendment against Mr. Tait's nomination on the ground that he was a director, but the motion was carried by an overwhelming majority.

The joint liquidators were thereafter empowered to carry on the business, so far as might be necessary for the beneficial winding up, or reconstruction, and to take the necessary steps for having the liquidation placed under the supervision of the Court of Session. A committee of shareholders was appointed to consult with the liquidators, and the meeting then terminated.

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According to the *Financial Times* of Wednesday, answers have been lodged in the Edinburgh Court of Session for Mr. C. J. Shiels, a preference shareholder of Bruce Peebles & Co., Ltd., objecting to the appointment of Mr. Andrew Wilson Tait, C.A., London, as official liquidator, on the grounds that he is not subject to the jurisdiction of the Court, that it is inexpedient that a director should be appointed liquidator, and that the expenses attendant on the appointment of a London accountant are undesirable in the interests of economy.

The *Financial Times* says that a London syndicate, headed by Lord Stanley, has been formed to complete the construction of the electric tramways and railways in Moscow. The municipality of that city undertook the work some years ago, but, after spending 17,000,000 roubles upon it, further progress was so hampered by the action of the revolutionary agencies that the municipality gave up the task and contracted for the remainder with a well-known Edinburgh firm, and the syndicate referred to having come to its aid, the operations are now expected to go forward without further delay.

## Smithfield Markets Electric Supply Co., Ltd.

MR. H. S. LEON presided at the meeting held at 57, Charterhouse Street, E.C., on Friday last. The capital account had been increased by only £134 during the year, spent upon acquiring new

business. The account had been credited with £1,300 for the first debenture stock which they purchased in the market at the end of 1906. The revenue account showed an increase in expenses of £541, which was entirely accounted for by the high price of coal during the year. Coal had cost £785 more than in the preceding year, and if it had not risen they would have had a considerable reduction in expenses, and consequently an increase in net profit. As a matter of fact, the cost would have been much more had they not made some very first-rate contracts at low prices extending over a year. He knew nothing about the coal trade, but his experience as an old business man told him that extremes went both ways, and when they had an extremely high price in such a commodity as coal, as had been the case during the year, the chances were that they might have an extremely low one—that he did not prophesy, they had to take their chance. The charges against revenue account had been reduced slightly by the interest on the debenture stock purchased—the annual saving in interest was £132. The cash reserves had increased from £12,000 to £16,000, £12,000 of which was earning interest. The general reserve now stood at £20,344, which included the net profit for 1907. Last year he referred somewhat extensively to their relations, and their position, with the Corporation of the City of London. The position remained practically unaltered. He did not mean to say that they were not seriously contemplating acting, but as far as he desired to say then it remained unaltered. The board begged that they would allow that question to remain in their hands without any strong cross-examination as to their doings, and he could only give them his personal assurance, and also that of his two colleagues, that it was now occupying their immediate and serious attention. A shareholder had written suggesting that the directors' and auditors' fees ought to be cut down. The directors, however, had a better claim upon the company now than even if they were in smooth water, for they had more anxiety, more work and more responsibility. The auditors' fee was only 40 guineas, and the time spent by them was well worth the money.

Mr. Browne Martin seconded the adoption of the report.

A Shareholder, who, presumably, was not present at last year's meeting, asked what was the "grievance" with the City Corporation.

The Chairman said that there was no "grievance," but he did not wish to say anything which would prejudice their position with the Corporation when they asked for an extension of their contract.

Mr. G. Brougham Glazier, with the idea of enlightening the shareholder who had asked the above question, entered into an account of what had happened after the last meeting, how that he and Dr. Butlin had met the directors and gone through a lot of papers, &c., the result of their inquiry being that they thought that the matter was best left in the hands of the directors, as a good time might occur for approaching the Corporation with a view to getting an extended term.

In reply to remarks by Mr. Huggins, the Chairman said that their liquid assets were lent out on security against loan, but the expediency of buying their own debentures in the market had been well discussed by the board; a certain amount had been bought and cancelled, but they did not feel justified in buying more until a permanent settlement was arrived at with the Corporation.

The report was adopted, and the retiring director and auditors were re-elected.

## Yorkshire (West Riding) Electric Tramways Co., Ltd.

The directors' report for 1907 states that the operations after providing for all expenses, including repairs and renewals, resulted in a net income of £27,378. Adding the balance brought forward £4,443, the available profit is £31,821. This has been dealt with as follows: Debenture interest (less income-tax) on 4½ per cent. stock, £11,756; debenture interest (less income-tax) on 6 per cent. bonds, £745; sundry reserves as per appropriation account, £9,857; carried forward, £9,463. The number of passengers carried was 8,627,247, and the miles run were 1,758,669, as against 6,169,148 and 1,414,767 respectively for 1906. The increase of passengers is chiefly due to the completion of the Normanton and Pontefract section, but a satisfactory expansion of traffic is also shown on the old routes. The Royal Assent has been obtained to the Bill which was deposited in Parliament for the purpose of obtaining powers to extend the time for the compulsory purchase of lands for and completion of tramways and other works authorised by the West Ridings Tramways Act, 1904.

Mr. Herbert S. Leon presided at the meeting which was held on Feb. 21 at 14, Victoria Street, S.W. He said that they had carried 2,458,099 more passengers than in 1906, run 343,902 more car-miles, and taken £14,845 more in fares. The increase in the net revenue was £8,349. The percentage of expenses to receipts was 49·525, as against 51·50 in 1906. The earnings per car-mile were 8·226d., as compared with 7·708d., an increase of ·518d. The working expenses per car-mile were 4·074d., against 3·963d., an increase of ·111d. Last year he stated that the working expenses were remarkably low, and the increase of that $\frac{1}{10}$d. per car-mile was only what could be reasonably expected, considering the extra repairs and maintenance of roads, rolling stock, machinery, &c., which they had to do during the year. The coal bill was also very much larger for the last three months of the year, new contracts having to be made in October at 3s. 2½d. per ton more than they had previously paid. The tramways generally were popular and progressive, and when a comparison was made with the balance-sheets published during the last three years, the growth was most satisfactory, and if maintained the company would soon be in a very comfortable position. The Normanton, Castleford and Pontefract section was opened in October, 1906, and since then it had shown very good prospect of good traffics. That had been borne out to some extent, but they hoped to do much better as the public became thoroughly accustomed to the trams, which he thought they were doing. The people of the district were very slow to move, and wanted educating into travelling. During the year the cars on that particular route ran 394,210 car-miles, and had carried 2,210,483 passengers and had earned in fares £14,701. He must mention with some regret that the cars were unable to run right into the town of Pontefract, because the Board of Trade had declined to certify that the line was geographically or physically right for public traffic, owing to the fact that there was not the 15 in. clearance between the line and the footpath. That could not be got without narrowing the footpath or buying and pulling down a considerable amount of property. The Corporation would not permit them to shave off 5⅛ in. from the footpath, and the board did not feel justified in spending money on unnecessary road widenings. The only alternative was to stop the cars about ¼ mile from the middle of the town, and this they did on November 4th last, since when the cars had not run right up to the top of the town. Mr. England could not say whether that had really prejudiced their traffic, but it was hoped that the Council would soon see things in a more reasonable light and do the necessary work which would comply with the requests of the Board of Trade. £10,992 had been set aside for repairs, renewals and depreciation, and out of this £6,693 had been spent during the year leaving £4 299 to carry forward on that account, and £5,000 had been placed to general reserve. Of the special reserve of £1,000 for accidents, £641 had been paid this year, and the balance of £358 was in hand. At first the company insured in the ordinary way with a company against party risks, but the insurance companies raised their premiums to such an extent that they thought they would take the risk themselves and put aside £1,000 a year every year to cover the claims which might be made upon them. Whether that was a good speculation or not on the part of board remained to be seen, but he recognised it was an arguable point. Anyhow, if there was a profit in insuring the company might just as well receive that profit rather than pay it away to an insurance company. Their capital expenditure for the year, over and above the estimates, amounted to £6,325 for new chimney stack, battery, buildings, booster, switchboard, &c., at Castleford, an extra boiler at Belle Isle, and so on. 295 men and boys were now employed, against 287 last year. They had had no labour troubles and no signs of dissatisfaction. They ran through districts controlled by many different local authorities, and they must realise how extremely difficult it was to live amicably with all those Councils while at the same time protecting the company's interests in those localities. The company had succeeded in doing that, and although they could not see eye to eye with the Corporation of Pontefract in respect to Front Street the company was on the best of terms with the different local authorities, and it was generally admitted that the tramways were a great boon to the district, and the company therefore received considerable help in the voluminous details requiring settlement from day to-day. Last year he said that the board had decided that the company should take a £4,500 mortgage in Lofthouse Park, since which it had decided to take £5,000 shares in addition. The park had been laid out, the roads made, and a large pavilion, bandstand, &c., had been built, and it was hoped that the whole place would be open to the public some time during the summer. This company was putting down a sub-station with the necessary machinery to supply all the extra power to the cars, and the energy for lighting the buildings and illuminating the grounds, &c. It was also forced upon them in order to anticipate the extra traffic which would come, to make sidings opposite the park to enable the cars to turn there without interfering with the general traffic on the road, and so that the cars might be available to deal with rushes of traffic that must occur at certain times. Their justification for the large expenditure in this direction must be that when the park was opened it must bring a great amount of traffic and profit to the company, and if that traffic was as large as it was expected to be, the outlay of £4,000 on mortgage, and £5,000 in shares, and upwards of £6,000 in extra equipments, should be a most remunerative investment. Of course, it was expected that the Park Co. would pay its interest on the mortgage, and a dividend on the shares, but if it did not do that, even if the park was unfortunate, and could not even pay its interest and dividend, the company was sure to get sufficient profit by the passengers it would carry to cover the loss of interest on the money sunk in the enterprise. He hoped that when the results were known after the opening of the park, they would prove to be right in those opinions. It was naturally with great regret that the board had not the money wherewith to pay a dividend. They had earned a dividend and could not pay it, but he, for one, refused to reproach shareholders for one moment for not advancing them the necessary money for a long period, which proposition was made by him last year. If they had consented, it would have enabled the board to pay a small dividend on the preference shares. He would have liked to have had a more favourable answer from them, although he did not believe that in the long run the company was going to be any worse off because they answered the appeal in the negative. They were forced to borrow money wherewith to pay their debts, and they were prevented now from paying a dividend because of their outstanding liabilities, which must be met in cash. They borrowed £30,000 at 6 per cent. interest, to be paid off by five annual drawings. No com-

mission was paid or underwriting given. Messrs. Dick, Kerr and Co., Ltd., took £15,000, a few of the preference shareholders took £4,300, and he and his family took the remainder. Those were the only terms on which they could raise money at all, and he must ask them to consider, as he did, that that financing was particularly well done. With regard to the future, they had a good business in front of them; they dealt with a very large and growing district; they were a carefully-managed company. They intended to run the business, not as a means of speculating on the Stock Exchange, buying and selling shares and so forth, but as a real *bona fide* business as a corporate body. Dividends on the preference shares were perfectly certain if the shareholders would only have a little patience. The debentures should be considered as quite a first-class security, considering the amount of money which had been put into the business, even after the debentures were issued. Without being unduly sanguine, by this time next year, unless something unfortunate occurred, there would be some cash dividend to divide.

Mr. W. B. Keen seconded the adoption of the report.

A shareholder asked a question concerning the clearance at Pontefract, and in reply the Chairman said that the cars were run for twelve months, and they chanced the displeasure of the Board of Trade. They had now threatened Pontefract that they would take the tramways up. Another shareholder drew attention to the dead weight item of £41 000 for preliminary expenses. He remarked that the chairman had said that if the shareholders had come forward last year with the required capital he would have distributed a cash dividend. He did not object to cash dividends, but it must be a very small cash dividend until they could get rid of that preliminary expense item, if they worked on sound financial lines.

The report was adopted, and the retiring directors and auditors were re-elected.

## National Telephone Co.

On Thursday of last week Mr. George Franklin presided over the forty-first ordinary general meeting of the company, held at Hamilton House, Victoria Embankment.

In moving the adoption of the report (see Electrical Review, February 14th, page 273), the Chairman said he thought the story of the half-year and the year's working would be satisfactory to the shareholders, whose capital subscriptions had made such development possible, and to the telephone-using public, whose wants they endeavoured to supply. The income accrued in respect of the business of the half-year had increased by £145,346, as compared with the corresponding period. The Post Office royalties had absorbed £132,621, an increase of £14,121, and the working expenses amounted to £780,332, an increase of £69,840. The rates and taxes and rents had increased by £9,637, largely due to the insurance liability imposed by the Workmen's Compensation Act, 1906. The administration and management expenses showed an increase of £37,602, due to the growth of the business. That sum included the £15,000 which had been transferred to the compensation fund authorised by the shareholders last year. Maintenance and renewals of lines had increased £17,135, but the percentage of working expenditure to net incomes had fallen to 62·20, the lowest point in any half-year since 1902. The net result of the company's working—£474,235—showed an increase of £61,385, appropriated by an increase in the debenture and other interest of £7,258, £42,103 in increased dividends, and £10,000 more to reserve, which, with the differences in balances brought forward and carried forward, accounted for the whole sum. The figures for the year 1907 showed an increase over 1906 of £265,233 in income, whilst a year ago the increase was only £224,636. Post Office royalties had increased by £26,071, and the working expenses by £127,863, the net result being £111,299. The percentage of working expenses to net income was 63·59, as against 62·60. The capital expended during the last three years had been, in 1905, £975,119; in 1906, £1,129,671; and in 1907, £1,129 511. Those figures spoke eloquently of the confidence of the shareholders, whatever the opinion of their critics might be. The available profits had been distributed as follows: Debenture and other interests, £18,891; preference and ordinary dividends, £71,795; reserve, £20,000; and the increased balances brought forward accounted for the rest. As to the distribution of the dividends, the board had given the subject the most careful consideration, and they recommended 6 per cent. per annum on the deferred stock, after putting aside during the year £275,000 to reserve, which now stood at £2,612,000, and they hoped to make that sum strong enough to protect the shareholders' capital from any shrinkage as a result of whatever valuation might be put upon the company's plant at the expiration of their licence. The capital expenditure was £13,546,376, which gave them, divided up among the total number of stations, a capital cost of £30 5s. 11d. per station, as compared with £30 9s. 1d. a year ago. With the lands and buildings, £651,696, they had a total capital expenditure of £14,198,072, as against share and debenture capital subscribed, £11,113,174, leaving £3,084,898 provided from revenue sources. They had been asked: "Where is the reserve, and how is it represented?" It was invested in the business, and to the extent of upwards of £650,000 in freehold and leasehold properties. If it was prudent and profitable for the company to spend other people's money in prosecuting the business, it was quite as prudent and profitable to utilise their own money in that way. Stock and materials stood at £413,722; an increase of £18,605 in the year, which was due to large quantities of instruments having been returned to the company's factory, consequent upon the adoption of the common battery system in replacement of the magneto system. Those instruments would be available for extension or development of magneto exchanges. It was hoped that it could be looked upon as a diminishing item. The number of stations had increased by 39,372, which was evidence of the vitality of the company's business. He thought that that was evidence that they were doing the best they could with the capital the shareholders had entrusted to them. Of these 39,000 stations, most of them were upon what was known as the measured rate. The development of telephone enterprise had demonstrated the absolute unsoundness of the flat rate—an annual charge for as many calls as the subscriber chose to send. The evils which resulted from that method were only discovered as the result of long experience. They had over-loaded lines, congestion of traffic, and "engaged" calls. The Postmaster-General recently before a deputation, said that he had made some tests in the matter, and he found that on the average, five years ago, when they first began their flat rate, certain subscribers were using 3,000 calls in the course of the year. In five years, those same subscribers, on the average, had increased their calls from 3,000 to 11,000. In no single case had the subscriber taken a second line—they were using the same line. They were paying no more for their 11,000 calls than they did five years ago, when they paid on the basis of their 3,000 calls. The National Telephone Co. had many cases of flat-rate lines used to excess. To such an extent were they used that 24 per cent. of the total calls had become defective owing to the lines being "engaged." The constant ringing up of the Exchange gave more work to the operators, and they blocked the traffic. It was not wise on the part of the subscriber to have his lines constantly engaged. In some cases a subscriber sent as many as 200 and 300 calls per day along the line, with the result that no one else could get into communication with him. It was not a fact that the cost of telephones in capital and maintenance was the same, whether the calls were few or many. It was peculiar to the telephone business that the larger the number of subscribers the greater the capital cost per subscriber. For instance, if they had one exchange with 1,000 subscribers, the capital outlay on switchboards and junctions would be £4 per subscriber, but if there were 10,000 subscribers, the capital cost would be £13 each subscriber. That was an important factor to remember in the growth of a telephone business. For these reasons the board had felt bound to co-operate with the Postmaster-General in bringing into force throughout the provinces a measured-rate service, although they continued the flat rate to existing subscribers. The United States, Austria, Germany and other European countries had adopted the measured system. The company was installing at all the common battery exchanges an electrical system of registration which would be much quicker and much more certain than recording by hand. The experience of the new system had shown that so far the payments had increased by 20 per cent. It was said by their critics that they were a very prosperous concern, with watered capital, inferior plant, &c. The fact was, that the interest and dividends paid as a distribution on the capital had never reached 4½ per cent. per annum. When they considered the past history of the company, the exaction of one-tenth of their gross earnings, and more than one-fifth of their net income in the shape of Post Office royalties, the rates and taxes, the refusal of wayleave powers, and competition unfairly forced upon them, they were apt at times to wonder how they had survived the perils of the past. The number of the staff had increased during the year from 16,310 to 17,911, an increase of 1,601, and the number of shareholders from 11,647 to 12,628, an increase of 981, with an average holding of £593.

Mr. S. K. Sands seconded the motion.

The Chairman, in reply to the shareholders' criticisms, remarked that the company had 93,020 stations in London, as compared with 46,355 of the Post Office. The National Co.'s stations had increased during the year by 9,823, as compared with 7,162 in the case of the Post Office. The capital cost of the Post Office stations—about £50—could not be compared with the company's £30, as the Government's figure referred to London, where the system was entirely underground, which increased the cost. In Germany the capital expenditure was £27 to £28 per station. They had a balance in hand of capital of £560,000, which would suffice for some little time.

The report was adopted.

## Charing Cross, West End and City Electricity Supply Co., Ltd.

The directors in their report state that the results of the trading for 1907 have been satisfactory.

*West End Undertakings.*—The gross earnings of these undertakings from sales of current, rents, &c., were £131,921 compared with £126,146 in 1906, and the expenses, including depreciation, were £80,114 compared with £84,088 in 1906. The net earnings were thus £51,806 against £42,058 in 1906. After bringing in the balance of £4,575 from last year, and paying interest on the debenture stock, there is a balance on net revenue account of £42,023 out of which the dividend for the year on the preference shares amounting to £18,000, and an interim dividend for the first half-year at the rate of 5 per cent. per annum on the ordinary shares amounting to £10,000 have been paid, leaving a balance of £14,023 to be dealt with. It is proposed to pay a final dividend for the second half-year at the rate of 5 per cent. per annum, making 5 per cent. for the whole year, absorbing £10,000, carrying forward £4,023. The company has now connected to its West End mains the total equivalent of 538,964 8-c.p. (or 30-watt) lamps, an increase of 28,375. The total is made up as follows:—391,201 in lighting, 10,238 in heating, and 137,525 (5,501 h.p.—4,129 kw.) in motors.

*City Undertaking.*—The gross earnings of this undertaking from sales of current, rents, &c., were £118,544, compared with £105,503 in 1906; the expenses were £63,748 compared with £57,325. The net earnings were £54,795 against £48,178. Interest on debenture bonds (£460,000) absorbed £22,875, interest on loans (£155,705) £7,258, and dividend on the preference shares (£400,000) £18,000, altogether £48,133 against £47,687, leaving £6,662 against £491. From this is deducted the deficiency on preference shares' dividend, 1902-1905, £4,406, leaving Cr. £2,256 for 1907, against Dr. £4,406 in 1906, when £4,897 was the amount for deficiency on preference shares dividend. The City Undertaking has, therefore, been able out of its revenue for the year 1907 to pay the interest on its debenture bonds and dividend on its preference shares, to repay the balance of £4,406 to the West End Undertakings, and to carry forward £2,256. The company has now connected to its City mains the total equivalent of 454,757 8-c.p. (or 30-watt) lamps, which is an increase of 42,073 upon last year's figures. The total includes 287,787 in lighting, 26,770 in heating, and 140,200 (5,608 H.P.—4,209 KW.) in motors. The chief engineer certifies that the plant and machinery in the several stations of the company has been maintained in a high state of efficiency. No progress was made in the last session of Parliament towards settling the question of the bulk supply of power in the Metropolitan area. The L.C.C.'s Bill was rejected by the Hybrid Committee of the House of Commons, which was appointed to consider it, and the Bill promoted by the London electric supply companies (in the application for which this company had joined) was withdrawn. The question has again been carefully considered by the board, in conjunction with the boards of other electric lighting companies. The directors are still of opinion that the most practical way of dealing with the question is to entrust the bulk supply to an undertaking composed either of all or some of the London electric supply companies. With this end in view a Bill is being promoted in the present session of Parliament to constitute a joint committee representing eight of the London electric supply companies. The chief object of this joint committee will be the rendering of mutual assistance and the giving of a supply of energy in bulk.

Statement of Electricity Generated, Sold, &c., 1907.

City Undertaking.

| | |
|---|---|
| Quantity generated in B.O.T. units | 21,618,614 |
| Quantity bought in B.O.T. units | 576,064 |
| Sold | 18,172,481 |
| Quantity used on works, and transmission and distribution losses | 4,022,247 |
| Total quantity accounted for | 22,194,678 |
| Total maximum supply demanded in KW. | 10,849 |

West End Undertakings.

| | |
|---|---|
| Quantity generated in B.O.T. units | 5,569,101 |
| Quantity bought in B.O.T. units | 9,568,690 |
| Quantity sold—Public lamps | 452,647 |
| Other sales | 10,461,150 |
| Total sold in B.O.T. units | 10,913,797 |
| Quantity used on works, and transmission and distribution losses | 4,323,994 |
| Total quantity accounted for | 15,137,791 |
| Number of public lamps | 166 |
| Total maximum supply demanded in KW. | 5,681 |

H. W. Kingston, *Engineer-in-chief.*

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**Simplex Conduits, Ltd.**—The second annual ordinary general meeting was held at the company's offices, Garrison Lane, Birmingham, last week. Mr. Henry Huggins presided, and the other directors present were Mr. F. Huggins and Mr. L. M. Waterhouse (managing director). The profits of the year, after providing for bad and doubtful debts, amount with interest on investments and transfer fees, to £13,894, and after charging directors' fees, depreciation and income-tax (£2,340), and adding the amount brought forward from last year (£1,380), there remains for disposal £12,934. The chairman congratulated the shareholders upon the result of the year, pointing out that after paying a dividend of 6 per cent. on the preference shares, amounting to £2,280, and 10 per cent. on the ordinary shares, absorbing £4,000, they had carried £4,000 to reserve and £2,653 forward to next year.

**Lanarkshire Tramways Co.**—Mr. A. R. Monks presided at the annual meeting held on Thursday last week at 83, Cannon Street, E.C. In moving the adoption of the report (see Electrical Review, February 14th, page 276), he referred to the fact that that they were applying for extension of time for carrying out their tramway extension, the unfavourable condition of the money market being the cause of the delay in the matter. The retiring directors were re-elected, and Mr. L. E. Halsey was appointed auditor in place of Mr. E. Waterhouse, who did not seek re-election.

**Telegraph Construction and Maintenance Co., Ltd.**—The directors' report for 1907 shows a net profit of £83,572, after charging the interest on the debentures. To this sum must be added £104,309 brought forward from last year, making a total of £187,880. From this amount is deducted the interim dividend of 5 per cent., paid July 23rd, 1907, amounting to £22,410, leaving £165,470 to be dealt with. Of this sum the directors propose to distribute a dividend at £1 4s. per share, together with a bonus of 6s. per share, absorbing £56,025, being at the rate of 12½ per cent., and making, with the amount already paid, a total dividend for the year of £2 2s. per share, or 17½ per cent., free of income-tax, leaving £109,445 to be carried forward to the next account. The general business of the company during the past year has been very satisfactory. The company's works and steamships have been maintained in their usual state of efficiency. For 1906 the dividend totalled 15 per cent.

**Oxford Electric Co., Ltd.**—The directors' report for 1907 says that the revenue account shows a profit (including £896 brought forward) of £15,849. After providing £2,000 for debenture interest and writing off £2,329 on account of hire-purchase and college installations, the balance available for dividend is £11,519. A dividend at the rate of 7 per cent. per annum, free of income-tax, on the ordinary shares (whereof 2½ per cent. was paid in September last) requires £7,000; 5 per cent. dividend on the preference shares absorbs £1,042; there is placed to credit of reserve and renewal of plant account £2,500, and £978 is carried forward. It is estimated that at December 31st last there was the equivalent of over 91,000 8-c.p. lamps connected to the mains. The units sold during 1907 were 12 per cent. in excess of those sold in 1906. A considerable portion of this increase is due to current supplied for motive power purposes. The capacity of the generating station and distributing sub-stations has been increased by 150 KW. The supply mains have been extended in the Woodstock, Lonsdale, Portland, Hamilton, King's Cross, Linton, Marston Ferry, Cowley and Divinity Roads, also in St. Michael and Walton Streets. The high-tension system of mains has been extended to connect the East Oxford sub-stations.

**County of London Electric Supply Co., Ltd.**—The directors have decided to recommend payment of final dividends upon the preference shares at the rate of 6 per cent. per annum for the half-year ended December 31st, 1907, less income-tax, and on the ordinary shares of the company at the rate of 6 per cent. per annum, less income-tax, for the half-year ended December 31st, 1907, making 5 per cent. for the year on the ordinary shares. £25,000 has been placed to reserve for depreciation and £4,381 carried forward. Last year the ordinary dividend was at the same rate, and £21,000 was carried to reserve, £5,000 being carried forward.

**Stock Exchange Notices.**—Applications have been made to the Committee to appoint a special setting day in and to grant a quotation to:—

Montreal Light, Heat and Power Co.—Scrip (fully-paid and partly-paid) for $400,000 4½ per cent. first mortgage bonds.

And to allow the following securities to be quoted in the Official List:—

Commercial Cable Co.—Further issue of £82,917 sterling 500-year 4 per cent. debenture stock.

The Committee has ordered the undermentioned to be quoted in the Official List:—

Commercial Cable Co.—Further issue of £82,917 sterling 500-year 4 per cent. debenture stock.
Shawinigan Water and Power Co.—Further issue of £49,453 4½ per cent. perpetual consolidated mortgage debenture stock.

**Buenos Ayres and Belgrano Electric Tramways Co., Ltd.**—The annual meeting was held on 20th inst. at Winchester House, Mr. J. B. Concanon presiding. The chairman said that the accounts submitted comprised the working of the undertaking for the half-year ended June 30th, 1907, and also the half-yearly instalment received in accordance with the agreement for the sale of the property. The actual net profits for the first six months of 1907 were £32,668, which was considerably more than would have been the case had they had to provide for depreciation and renewals. He moved the adoption of the report, and this was seconded, but a shareholder wanted to know why the dividend was not going to be declared on the ordinary shares. The chairman said that he explained that last November, and the present report stated that it was not proposed to pay that dividend, owing to the fact that before it could be paid they would have to go to the Courts for a reduction of capital. The directors hoped to be able to make a distribution to debenture and preference shareholders and a large distribution to ordinary shareholders in July, and they did not want to spend money going to the Courts in order to save a few months.

At a subsequent extraordinary general meeting, at which an alteration in the articles was made, providing for the shareholders to have the power to vote special remuneration to the board, officers, &c., upon the completion of the sale of the undertaking, the chairman said that the distribution to the ordinary shareholders would be something like £4 16s. per share.

**Northampton Electric Light and Power Co., Ltd.**—The report for 1907 shows that that the number of consumers increased by 108. 3,222 lamps and 3,990 motors (these reckoned as 8-c.p. lamps) were added, a total of 7,212. The H.P. of motors increased from 604 to 737, 527 H.P. being hired from the company. One mile 613 yards of mains were laid, and the total mileage of the mains is now 20 miles 959 yards. The output of units was 837,161, an increase of 11½ per cent., and the maximum load on plant showed a 10½ per cent. increase. The development of the business calls for a further increase in the generating plant, and this will necessitate additional capital outlay during the present year. The directors propose to add £2,000 to the depreciation account, to write £100 off the motors, and to apply £1,886 in payment of a half-year's dividend. The dividend at 5 per cent. on preference shares will absorb £626, and one at 6 per cent. on the ordinary shares (making 5 per cent. for the year) £1,908, leaving £162 to be carried forward.

**W. T. Henley's Telegraph Works Co., Ltd.**—Subject to audit, the directors recommend a dividend on the ordinary shares of 15 per cent., less income-tax, including the interim dividend of 5 per cent. paid in September 2nd last. The dividend for 1906 was at the same rate.

**Italy.**—La Società Italiana Accumulatori Elettrici, of Milan, is increasing its capital from £60,000 to £80,000.

## ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

| Locality. | Fortnight ended. | Receipts for the fortnight. £ | £* | No. of wks. | Total to date. £ | £* | Route miles open. | Inc. |
|---|---|---|---|---|---|---|---|---|
| Aberdeen | Feb. 19 | 2,350 | + 19 | 38 | 52,671 | — 1,292 | 14·4 | .. |
| Ayr | ,, 22 | 365 | + 31 | 41 | 13,175 | — 5 | 8 | .. |
| Bath | ,, 19 | 1,135 | — 7 | 7 | 3,907 | — 317 | 12 | .. |
| Belfast | ,, 21 | 7,040 | + 726 | 47 | 171,076 | +11,525 | 36 | .. |
| Birkenhead | ,, 28 | 1,917 | + 10 | 46 | 49,412 | + 208 | 18·52 | .. |
| Birmingham Corp. | ,, 15 | 18,656 | +2,078 | 7 | 40,979 | + 5,980 | 66·46 | .. |
| Blackburn | ,, 19 | 1,969 | + 156 | 47½ | 51,750 | + 3,608 | 14·13 | .. |
| Blackpool Corp. | ,, 20 | 684 | + 23 | .. | 50,448 | — 1,178 | 11·87 | .. |
| ,, – Fleetw'd. | ,, 22 | 410 | + 56 | 7 | 1,476 | + 40 | 8·25 | .. |
| Bolton | ,, 23 | 4,176 | + 359 | 47 | 105,913 | + 6,589 | 26 | .. |
| Bournemouth | ,, 19 | 2,625 | + 178 | 46½ | 77,896 | + 2,090 | 21·5 | .. |
| Bradford | ,, 15 | 8,517 | + 621 | 46 | 211,285 | + 5,359 | 53·9 | 1 |
| Brighton | ,, 23 | 1,352 | + 23 | 47 | 41,707 | .. | 9·5 | .. |
| Bristol | ,, 21 | 9,097 | — 13 | .. | .. | .. | 12·21 | .. |
| Brit. Elec. Trac. Co. | | | | | | | | |
| Airdrie | ,, 14 | 436 | + 5 | 6 | 1,425 | + 71 | 3·65 | .. |
| Barnsley | ,, 14 | 334 | + 31 | ,, | 1,011 | + 89 | .. | .. |
| Barrow | ,, 14 | 413 | + 9 | ,, | 1,312 | + 34 | 5·37 | .. |
| Cavehill | ,, 14 | 123 | + 25 | ,, | 356 | - 58 | .. | .. |
| Devonport | ,, 14 | 807 | + 26 | ,, | 2,666 | + 8 | 8·85 | .. |
| Gateshead | ,, 14 | 1,987 | + 96 | ,, | 6,242 | + 326 | 11·25 | .. |
| Gravesend | ,, 14 | 373 | — 7 | ,, | 1,162 | — 63 | 6·5 | .. |
| Greenock | ,, 14 | 949 | — 300 | ,, | 2,903 | — 598 | 7·25 | .. |
| Hartlepool | ,, 14 | 435 | — 44 | ,, | 1,430 | — 19 | 6·72 | .. |
| Kidderminster | ,, 14 | 161 | — 6 | ,, | 511 | — 18 | .. | .. |
| Leamington | ,, 14 | 249 | + 27 | ,, | 790 | + 32 | 3 | .. |
| Merthyr | ,, 14 | 384 | + 15 | ,, | 1,201 | + 47 | 2·9 | .. |
| Metropolitan | ,, 14 | 9,533 | +2,781 | ,, | 29,193 | + 6,633 | 22 | .. |
| Middleton | ,, 14 | 618 | + 66 | ,, | 1,836 | + 107 | 8·5 | .. |
| Mid. Joint Com'tee | ,, 14 | 11,114 | + 884 | ,, | 33,127 | + 976 | .. | .. |
| Oldham—Ashton | ,, 14 | 1,124 | + 40 | ,, | 3,446 | + 56 | 9·13 | .. |
| Peterborough | ,, 14 | 202 | + 14 | ,, | 629 | + 43 | 5·31 | .. |
| Potteries | ,, 14 | 3,476 | + 56 | ,, | 11,892 | + 823 | 29 | .. |
| Rothesay | ,, 14 | 99 | + 13 | ,, | 309 | + 32 | 2·75 | .. |
| Southport | ,, 14 | 282 | + 5 | ,, | 1,164 | — 60 | 8·17 | .. |
| S. Metropolitan | ,, 14 | 1,307 | + 153 | ,, | 4,013 | + 188 | .. | .. |
| Swansea | ,, 14 | 1,684 | + 207 | ,, | 5,120 | + 337 | 5·5 | .. |
| Tynemouth | ,, 14 | 269 | — 4 | ,, | 900 | + 16 | 3·75 | .. |
| Weston-s-Mare | ,, 12 | 49 | + 4 | ,, | 149 | + 2 | 3 | .. |
| †Worcester | ,, 14 | 471 | + 46 | ,, | 1,448 | + 43 | 5·75 | .. |
| Wrexham | ,, 14 | 178 | + 6 | ,, | 545 | + 4 | .. | .. |
| Yorks. Wool. Dist. | ,, 14 | 1,694 | + 14 | ,, | 5,322 | — 39 | 17 | .. |
| Miscellaneous | ,, 14 | 362 | + 13 | ,, | 1,144 | + 64 | .. | .. |
| Burnley | ,, 22 | 2,178 | + 42 | .. | .. | .. | 7·5 | .. |
| Burton-on-Trent | ,, 28 | 486 | — 24 | 47 | 19,148 | — 642 | 11 | 2 |
| Bury | ,, 16 | 2,014 | + 291 | 46 | 50,783 | + 6,260 | 10·5 | .. |
| Cardiff | ,, 15 | 3,730 | + 164 | 46 | 97,795 | + 2,978 | 15·87 | .. |
| Carlisle | ,, 22 | 300 | + 23 | 8 | 1,177 | + 70 | .. | .. |
| Chatham and Dist. | ,, 20 | 1,202 | — 26 | 7 | 4,801 | — 178 | 13·21 | .. |
| Cork | ,, 20 | 768 | — 22 | 7 | 2,777 | — 199 | 9·89 | .. |
| Croydon | ,, 21 | 2,427 | + 108 | 47 | 65,337 | — 1,328 | 12 | ·75 |
| †Darlington | ,, 15 | 189 | — 9 | 46 | 9,664 | + 32 | .. | .. |
| Darwen | ,, 21 | 449 | + 3 | 47 | 11,830 | — 40 | 4·26 | .. |
| Dover | ,, 15 | 285 | — 36 | 46 | 10,100 | — 1,257 | 4·75 | .. |
| Dublin | ,, 21 | 9,567 | + 513 | .. | 34,983 | + 837 | 54·25 | 5·5 |
| Dundee | ,, 12 | 2,211 | + 195 | 40 | 45,987 | + 2,090 | 14·5 | .. |
| East Ham | ,, 22 | 1,570 | — 78 | 47 | 42,195 | + 469 | 7·75 | .. |
| †Exeter | ,, 6 | 340 | — 12 | 36 | 11,507 | + 551 | 4·75 | ·5 |
| Glasgow | ,, 22 | 33,152 | +1,077 | 87½ | 663,195 | +18,950 | 89·25 | 5·5 |
| Hastings | ,, 21 | 1,461 | + 135 | .. | .. | .. | .. | .. |
| Hull | ,, 22 | 4,710 | + 147 | 47 | 115,977 | + 6,507 | 18 | .. |
| Ilkeston | ,, 19 | 248 | + 1 | 47 | 6,585 | + 405 | 3·5 | .. |
| †Ipswich | ,, 15 | 299 | — 10 | 46 | 18,092 | — 1,092 | 10·5 | .. |
| †Isle of Thanet | Jan. 4 | 199 | — 16 | .. | .. | .. | 11 | .. |
| Kilmarnock | Feb. 22 | 288 | + 6 | 40 | 6,351 | — 150 | 4·25 | .. |
| Lan'kshire Trm Co. | ,, 20 | 2,468 | + 431 | 7 | 9,142 | + 1,938 | 15·82 | 3·26 |
| Lancashire United | ,, 19 | 2,800 | + 246 | 7 | 7,967 | + 669 | 30 | 1 |
| Leeds | ,, 15 | 12,115 | + 516 | 46 | 298,548 | +12,765 | 96 | 6·5 |
| Leicester | ,, 22 | 4,139 | + 96 | .. | .. | .. | .. | .. |
| Leith | ,, 15 | 988 | + 18 | 39½ | 20,570 | + 171 | 6 | .. |
| Liverpool | ,, 15 | 20,674 | + 585 | 7 | 66,916 | — 972 | 104 | .. |
| ‡L.C.C. | ,, 8 | 59,499 | +9,245 | 45 | 1,400,384 | +227,133 | 116·5 | 10 |
| London United | ,, 22 | 11,523 | + 496 | .. | 38,336 | — 57 | .. | .. |
| Lowestoft | ,, 22 | 284 | + 28 | 21 | 3,330 | + 146 | 3·5 | .. |
| Manchester | ,, 22 | 27,519 | +1,219 | 47 | 688,655 | +44,776 | 86 | 11 |
| Newcastle | ,, 22 | 7,463 | — 336 | 47 | 191,045 | + 986 | .. | .. |
| Newport | ,, 15 | 1,114 | + 14 | 46 | 30,922 | + 2,087 | 14·5 | .. |
| Northampton | ,, 21 | 746 | + 5 | 45½ | 20,008 | — 235 | 5·5 | .. |
| Oldham | ,, 28 | 3 582 | + 204 | 48 | 91,845 | + 6,168 | 23·75 | .. |
| Pontypridd | ,, 22 | 599 | + 287 | 47 | 12,977 | + 5,172 | 5 | 1·75 |
| Portsmouth | ,, 22 | 2,908 | + 161 | 47 | 89 884 | — 712 | 14·5 | .. |
| Preston | ,, 19 | 1,328 | + 22 | .. | .. | .. | .. | .. |
| †Reading | ,, 20 | 546 | + 9 | 46½ | 28,682 | — 675 | 13·25 | .. |
| Rotherham | ,, 20 | 1,178 | + 95 | 46½ | 28,308 | + 4,505 | 10 | ·66 |
| Salford | ,, 17 | 8,607 | + 396 | 45 | 212,537 | + 6.612 | 38·9 | .. |
| Sheffield | ,, 28 | 10,407 | — 40 | 48 | 266,809 | +11,689 | 35·75 | .. |
| Southampton | ,, 19 | 1,763 | + 173 | 46½ | 47,481 | + 2,980 | .. | .. |
| Southend-on-Sea | ,, 19 | 516 | + 29 | 47 | 18 256 | + 168 | .. | .. |
| Sunderland | ,, 28 | 2,129 | — 357 | 47 | 63,165 | — 2,176 | .. | .. |
| Swindon | ,, 5 | 274 | + 22 | .. | .. | .. | 4·4 | .. |
| Tyneside | ,, 19 | 725 | — 26 | 8 | 2,557 | — 72 | 8·87 | .. |
| Wallasey | ,, 22 | 1,440 | + 27 | 47 | 38,798 | + 714 | 8·72 | ·22 |
| Walthamstow | ,, 22 | 560 | + 234 | 47 | 27,794 | + 1,748 | 9 | .. |
| West Ham | ,, 20 | 4,128 | — 6 | 47 | 107,886 | + 2,197 | 14·7 | .. |
| Wolverhampton | ,, 19 | 1,502 | — 5 | 46 | 42,261 | + 640 | 13·5 | .. |
| †Yorks. W. Riding | Jan. 8 | 1 084 | + 87 | 49 | 56,924 | .. | .. | .. |
| Baker St.-Waterloo | Feb. 22 | 5,970 | +1,130 | 8 | 24,820 | + 5,749 | 4·25 | 1 |
| Cen. London Rly. | ,, 22 | 11 875 | — 818 | 8 | 49.180 | — 2,085 | 5·77 | .. |
| Char. +, Eus. Hamp. | ,, 22 | 6.110 | .. | 8 | 25,115 | .. | 7·75 | .. |
| City & S. Lon. Rly. | ,, 28 | 6,454 | + 331 | 8 | 27,275 | + 2,419 | 7·3 | 1·05 |
| Dublin-Lucan Rly. | ,, 21 | 201 | + 25 | 8 | 686 | + 27 | 7 | .. |
| G.N. and City Rly. | ,, 22 | 3,612 | — 155 | 8 | 14,792 | — 570 | 3·5 | .. |
| G.N., P'dy. & Brmp. | ,, 22 | 10 490 | +2,720 | 8 | 48,065 | +13,706 | 9·25 | ·25 |
| L'pool Overh'd Rly. | ,, 28 | 2,838 | + 196 | 8 | 11,004 | + 133 | 6·6 | 4·2 |
| Mersey Railway | ,, 22 | 3 690 | + 153 | 8 | 15,222 | + 787 | 4·5 | .. |
| Metropolitan Rly. | ,, 28 | 29.512 | + 89 | 8 | 121,914 | + 408 | 24·5 | .. |
| Met. District Rly. | ,, 22 | 17,634 | +1,463 | 8 | 71,278 | + 7,179 | 24 | .. |
| Anglo-Argentine | ,, 18 | 35,383 | +4 140 | 7 | 125,102 | +12,728 | 48 | .. |
| §Auckland | Jan. 31 | 12,187 | +1,709 | .. | .. | .. | 19·2 | ·56 |
| §Brisbane | ,, 31 | 14 340 | +1,875 | .. | .. | .. | .. | .. |
| Buenos A. & Belgr'o. | Feb. 18 | 7,360 | + 208 | 7 | 25,580 | — 66 | .. | .. |
| Calcutta | ,, 22 | 6,485 | — 77 | .. | .. | .. | .. | .. |
| §CapeElectricT.Ld. | Jan. | 15,4 4 | .. | .. | .. | .. | .. | .. |
| §Kalgoorlie, W.A. | ,, | 3,638 | .. | 4 | 3,638 | .. | 20·5 | .. |
| Madras | Feb. 15 | 1.321 | + 218 | 6½ | 3,964 | + 536 | 12·75 | .. |
| Perth (W.A.) | ,, 21 | 2,883 | — 116 | 8 | 11,059 | — 777 | 25·6 | 25·6 |

* Compared with the corresponding period of 1907. † One week only.
Includes horse, steam and other receipts. § One month.

## STOCKS AND SHARES.

Tuesday Evening.

Without much business to help them, and with fresh foreign political complications in the air, Stock Exchange markets are not very active. A good deal of irregularity prevails. The Home Railway department is somewhat startled by the sweeping condemnation of the Great Northern-Great Central agreement as an "unholy alliance," by the Chairman of the Midland Railway. Gilt-edged stocks are fairly steady, in hopes of a reduction in the Bank Rate. The gale of last week-end interfered seriously with telegraph and telephone work. These factors have reacted more or less upon electrical securities, and the result is the changes on the week are generally insignificant.

Brompton and Kensington Electric Supply shares have risen 10s. upon the maintenance of the dividend, making 10 per cent. for the year. In some quarters it had been feared that the distribution might have to be reduced, after the example of the Westminster Company. Other London issues are very quiet. South Londons fell to 2½. County Preference lost ½. Metropolitan First Debenture stock has again risen to the extent of a point. Good reports from the County of London, the Charing Cross and the Chelsea Companies, had no effect upon the prices of the Ordinary shares. There is still a little pressure to sell County of Durham Ordinary shares, and the price has receded to 3·3¾. Why it should be quoted in this lop-sided manner we doubt whether even the dealers responsible for it could adequately explain.

Electrical Railway varieties are fairly firm, all things considered. Central London Ordinary lost a point. In connection with the Franco-British Exhibition, the British Olympic Council has issued a stirring appeal for funds, in which the remarkable character of the gathering is clearly outlined. It clearly justifies the preparations that the railway companies are making for the transport of very heavy traffic. Metropolitan and District stocks have not changed.

Underground Railway of London profit-notes are 3 lower, after their nine-points rise of last week. Charing Cross, Euston and Hampstead 4 per cent. Debenture stock is being dealt in around 79, and Bakerloo Debentures were bought at 89¼ the other day. These prices, it is interesting to notice, compare with 101½ for Central London Debenture, and 102½ for City and South London Debenture, all the stocks carrying 4 per cent. interest.

Telegraph stocks and shares have halted on their ascending way. Great Northerns lost their recently-added 20s., and the Anglo-American group inclined to dulness. Eastern descriptions display no variation at all, nor has there been much trade in them. Western Telegraphs are a shade better.

The Trust Companies' issues in these circumstances are naturally quiet. Submarine Cables Trust Certificates have changed hands at 127. National Telephone stocks did not move at all. Opposition has raised its head to the proposal that the flat-rate system shall be more generally adopted, but the little outcry produced no effect upon the market. American Telephone stock has risen 2 to 111.

Manufacturing shares retain all their strength. Babcock and Wilcox rose ½, and a similar advance put British Aluminium "A" Preference up to 5⅞. Another point has been added to the Debenture stock of the British Westinghouse Company, bringing it to 45½. The 6 per cent. Preference shares stay about 13s. 6d. India-Rubber shares rose 5s. more, and the steady falls in the price of rubber and copper are stated to be doing the telegraph manufacturing companies a distinctly good turn. Telegraph Constructions hold their recent advance, and the report just issued is an excellent one.

Callender's and Henley's are firm as they can be, at their enhanced values. Henley's have declared a dividend, making 15 per cent. for the year.

Traction shares show steady progress in the case of the Argentine Companies, but British Electric Preference follow their monotonous downward jog-trot. London United Preference came on offer. Metropolitan Electric Tramways Debenture stock hardened to 98½.

**Prospectuses.**—*The British Guiana Rubber Corporation, Ltd.*—This company has been before the public with an issue of 8,115 shares of £1 each at par, as it has advantageously secured a more extensive and valuable area than that comprised in the lease and licence which it was originally formed to acquire.

*Hanipha (Ceylon) Tea and Rubber Co., Ltd.*—This company has been offering for subscription an issue of 45,000 £1 shares.

# SHARE LIST OF ELECTRICAL COMPANIES.

## TELEGRAPH AND TELEPHONE COMPANIES.

| Present Issue. | NAME. | Stock or Share. * | Dividends for the last four years. 1904. | 1905. | 1906. | 1907. | Closing Quotations Feb. 18th. | Closing Quotations Feb. 25th. | Business done week ended Feb. 25th, 1908. Highest. | Lowest. | Rise + or Fall — | Present Yield per cent. £ s. d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25,000 | Amazon Telegraph Co.'s shares, Nos. 1 to 25,000 | 10 | Nil | Nil | Nil | .. | 2 — 3 | 2 — 3 | .. | .. | .. | Nil |
| 143,800 | Do. do. 5 % Debs., Nos. 1 to 1,250 Red. | 100 | Nil | 5 % | 5 % | .. | 84 — 87 | 84 — 87 | .. | .. | .. | 5 14 11 |
| $131,551,400 | American Telephone & Telegraph, Cap. Stock .. | $100 | 7¼% | 7½% | 8 % | .. | 107 —111 | 109 —113 | .. | .. | +2 | 7 1 7 |
| 53,000,000 | Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000 | $1000 | 4 % | 4 % | 4 % | .. | 86 — 88 | 86 — 83 | .. | .. | .. | 4 10 11 |
| 622,600 | Anglo-American Telegraph .. .. .. .. | Stock | 2¾% | 3½% | 3¾% | 3½% | 56 — 59 xd | 55 — 58 | 56½ | .. | —1 | 6 0 8 |
| 3,188,700 | Do. do. do. 6 % Pref. .. .. | Stock | 5½% | 6 % | 6 % | 6 % | 99 —101 xd | 99 —101 | 100¼ | 99½ | .. | 5 18 10 |
| 3,188,700 | Do. do. do. Deferred .. .. | Stock | Nil | ½% | 1¾% | 1 % | 14 — 14½ xd | 13½— 14 | 14⅞ | 13⅛ | — ⅛ | 7 2 10 |
| 50,000 | Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red. | 100 | .. | 5 % | 5 % | .. | 99 —102 | 99 —102 | .. | .. | .. | 4 18 0 |
| 44,000 | Chili Telephone, Nos. 1 to 44,000 .. .. .. | 5 | 8 % | 8 % | 8 % | .. | 7 — 7½ | 7 — 7½ | 7 | .. | .. | 5 6 8 |
| 2,300,459 | Commercial Cable Stlng. 500 year 4 % Deb. Stk. Red. | Stock | 4 % | 4 % | 4 % | .. | 87 — 90 | 87 — 90 | 89 | 87½ | .. | 4 8 11 |
| 16,000 | Cuba Telegraph .. .. .. .. .. .. | 10 | 5 % | 5 % | 5 % | .. | 6¼— 7½ | 6½— 7⅝ | .. | .. | + ⅛ | 6 9 0 |
| 6,000 | Do. 10 % Pref. .. .. .. .. | 10 | 10 % | 10 % | 10 % | .. | 15½— 16½ | 15⅝— 16⅝ | .. | .. | .. | 5 19 5 |
| 12,981 | Direct Spanish Telegraph, Ord. .. .. .. | 5 | 4 % | 4 % | 4 % | .. | 3½— 3¾ | 3½— 3¾ | .. | .. | .. | 5 14 3 |
| 6,000 | Do. do. 10 % Cum. Pref. .. | 5 | 10 % | 10 % | 10 % | .. | 8¾— 9¼ | 8¾— 9½ | .. | .. | .. | 5 5 3 |
| 30,000 | Do. do. 4½ % Debs. .. .. | 50 | 4½% | 4½% | 4½% | .. | 99½—102½ | 99⅛—102½ | .. | .. | .. | 8 15 8 |
| 60,710 | Direct United States Cable .. .. .. .. | 20 | 3½% | 4½% | 4⅝% | .. | 13⅜— 14⅛ | 13⅜— 14⅛ | 14⅛ | 13⅛ | .. | 6 11 0 |
| 53,700 | Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R. | 100 | 4½% | 4½% | 4½% | .. | 99 —101 | 99 —101 | .. | .. | .. | 4 9 1 |
| 4,000,000 | Eastern Telegraph, Ord. Stock.. .. .. .. | Stock | 7 % | 7 % | 7 % | .. | 131 —136 | 131 —136 | 135 | 132 | .. | 5 2 11 |
| 2,000,000 | Do. 3½ % Pref. Stock.. .. .. .. | 100 | 3½% | 3½% | 3½% | .. | 84 — 87 | 84 — 87 | 86¾ | 84½ | .. | 4 0 6 |
| 1,896,706 | Do. 4 % Mort. Deb. Stock. Red. .. | Stock | 4 % | 4 % | 4 % | .. | 100 —103 | 100 —103 | 102½ | 100¾ | .. | 3 17 8 |
| 800,000 | Eastern Extension, Australasia, and China Tele. | 10 | 7 % | 7 % | 7 % | .. | 12¾— 13¼ | 12⅝— 13¼ | 13⅜ | 12⅜ | .. | 5 5 8 |
| 752,400 | Do. 4 % Deb. Stock .. .. .. .. | Stock | 4 % | 4 % | 4 % | 4 % | 99 —102 xd | 99 —102 | 101 | 100 | .. | 3 18 5 |
| 286,800 | East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909 | 100 | 4 % | 4 % | 4 % | 4 % | 98 —101 | 98 —101 | .. | .. | .. | 3 19 3 |
| 200,000 | Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000 | 25 | 4 % | 4 % | 4 % | .. | 99 —101 | 99 —101 | .. | .. | .. | 15 17 0 |
| 181,127 | Globe Telegraph and Trust .. .. .. .. | 10 | 5⅜% | 5⅜% | 5⅜% | .. | 10 — 10½ | 10 — 10½ | 10⅜ | 10¼ | .. | 5 4 9 |
| 181,127 | Do. do. 6 % Pref... .. .. .. | 10 | 6 % | 6 % | 6 % | .. | 13¾— 14½ | 13⅞— 14½ | 14⅞ | 13⅝ | .. | 4 4 3 |
| 150,000 | Great Northern Telegraph, of Copenhagen.. .. | 10 | 24 % | 24% | 20 % | .. | 33 — 35 | 32 — 34 | 33 | 32½ | .. | 5 17 8 |
| 24,300 | Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red. | 100 | 4½% | 4½% | 4½% | .. | 99 —101 | 99 —101 | .. | .. | .. | 4 9 1 |
| 17,000 | Indo-European Telegraph .. .. .. .. | 25 | 13 % | 13 % | 13 % | .. | 54 — 57 | 54 — 57 | .. | .. | .. | 6 11 7 |
| $41,380,400 | Mackay Companies Common .. .. .. .. | $100 | 1 % | 2 % | 3⅜% | .. | 58 — 63 | 58 — 63 | .. | .. | .. | 5 11 1 |
| $50,000,000 | Do. do. 4% Cum. Pref. .. .. .. | $100 | 4 % | 4 % | 4 % | .. | 61 — 67 | 61 — 67 | .. | .. | .. | 5 19 5 |
| 384,190 | Marconi's Wireless Telegraph .. .. .. .. | 1 | Nil | Nil | Nil | .. | ⅜— ⅝ | ⅜— ⅝ | .. | .. | .. | Nil |
| 72,680 | Monte Video Telephone Co., Ltd. Ord. .. .. .. | 1 | 4 % | 5 % | 6 % | .. | 1 1/16— 1 1/16 | 1 1/16— 1 1/16 | .. | .. | .. | 4 14 1 |
| 86,492 | Do. do. do. 5 % Pref. .. | 1 | 5 % | 5 % | 5 % | .. | 1— 1 | 1— 1 | .. | .. | .. | 5 0 0 |
| 2,225,000 | National Telephone, Pref. Stock .. .. .. | 100 | 6 % | 6 % | 6 % | 6 % | 111 —118 | 111 —118 | 112 | 111 | .. | 5 7 2 |
| 3,341,425 | Do. do. Def. Stock .. .. .. | 100 | 5 % | 5 % | 5 % | 6 % | 111½—113½ | 111½—113½ | 112⅜ | 111½ | .. | 5 5 9 |
| 15,000 | Do. do. 6 % Cum. 1st. Pref. .. .. | 10 | 6 % | 6 % | 6 % | 6 % | 11 — 13 | 11 — 13 | .. | .. | .. | 4 12 4 |
| 15,000 | Do. do. 6 % Cum. 2nd Pref. .. .. | 10 | 6 % | 6 % | 5 % | 5 % | 10½— 12½ | 10½— 12½ | .. | .. | .. | 4 0 0 |
| 250,000 | Do. do. 5 % Non-cum. 3rd P., 1 to 250,000 | 5 | 5 % | 5 % | 5 % | 5 % | 5 5/16— 5 7/16 | 5 5/16— 5 7/16 | 5⅜ | .. | .. | 4 8 11 |
| 2,000,000 | Do. do. 3½ % Deb. Stock Red. .. | Stock | 3½% | 3½% | 3½% | 3½% | 97 — 99 | 97 — 99 | 97½ | 97 | .. | 3 11 1 |
| 1,710,093 | Do. do. 4 % Deb. Stock Red. .. .. | 100 | 4 % | 4 % | 4 % | 4 % | 100½—102½ | 100½—102½ | 102¼ | 100½ | .. | 4 2 11 |
| 179,313 | Oriental Telep. and Elec. 1 to 171,504, fully paid .. | 1 | 6½% | 7 % | 7 % | .. | 1⅛— 1⅛ | 1⅛— 1⅛ | .. | .. | .. | 5 12 0 |
| 50,000 | Do. do. do. 6 % Cum. Pref... .. | 1 | 6 % | 6 % | 6 % | .. | 1 3/16— 1 3/16 | 1 3/16— 1 3/16 | .. | .. | .. | 4 18 0 |
| 99,100 | Do. do. do. 4 % Red. Deb. Stock .. | 100 | .. | 4 % | 4 % | .. | 90 — 93 | 90 — 93 | .. | .. | .. | 4 6 0 |
| 99,400 | Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000 | 10 | 4 % | 4 % | 4 % | .. | 98 —101 | 98 —101 | .. | .. | .. | 3 19 3 |
| 11,889 | Reuter's .. .. .. .. .. .. .. | 8 | 5 % | 5 % | 5 % | .. | 7½— 8½ | 7½— 8½ | .. | .. | .. | 4 19 3 |
| 99,100 | Telephone Co. of Egypt, 4½ % Deb. Red. .. | 100 | .. | 4½% | 4½% | .. | 99 —102 | 99 —102 | .. | .. | .. | 4 8 3 |
| 3,167 | Submarine Cables Trust .. .. .. .. | Cert. | 6 % | 6 % | 6 % | .. | 127 —130 | 127 —130 | .. | .. | .. | 4 12 4 |
| 100,000 | United River Plate Telephone .. .. .. .. | 5 | 8 % | 8 % | 8 % | .. | 6½— 7 | 6½— 7 | .. | .. | .. | 5 14 3 |
| 40,000 | Do. 5 % Cum. Pref., Nos. 1 to 40,000 | 5 | 5 % | 5 % | 5 % | .. | 4½— 5½ | 4½— 5½ | .. | .. | .. | 4 15 3 |
| 15,609 | West African Telegraph, Shares .. .. .. | 10 | 4½% | 4 % | 4 % | .. | 10 — 10½ | 10 — 10½ | .. | .. | .. | 3 16 2 |
| 30,008 | W. Coast of America, 1 to 30,000 & 53,001 to 53,008 | 2 | Nil | Nil | 2½% | .. | 1⅝— 2 | 1⅝— 2 | .. | .. | .. | 2 10 0 |
| 150,000 | Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel. | 100 | 4 % | 4 % | 4 % | .. | 98 —101 | 98 —101 | .. | .. | .. | 3 19 3 |
| 207,980 | Western Telegraph, Ltd., Nos. 1 to 207,980.. .. | 10 | 7 % | 7 % | 7 % | .. | 13⅜— 13 7/16 | 13⅛—13⅜ | 13 7/16 | 13 | + ⅛ | 5 1 10 |
| 800,000 | Do. do. 4 % Deb. Stock Red. .. | 100 | 4 % | 4 % | 4 % | .. | 98½—101½ | 98½—101½ | 99½ | .. | .. | 3 19 3 |
| 88,321 | West India and Panama Telegraph .. .. .. | 10 | Nil | Nil | Nil | .. | ⅛— ⅜ | ⅛— ⅜ | 10/9 | 10/7½ | .. | Nil |
| 34,563 | Do. do. 6 % Cum. 1st Pref. .. .. | 10 | 6 % | 5 % | 8 % | .. | 8 — 8½ | 8 — 8½ | 8¾ | 8 | .. | 9 8 2 |
| 4,669 | Do. do. 6 % Cum. 2nd Pref. .. .. | 10 | Nil | Nil | Nil | .. | 8 — 8½ | 8 — 8½ | 8 | .. | .. | Nil |
| 80,000 | Do. do. 5 % Debs., Nos. 1 to 1,800 .. | 100 | 5 % | 5 % | 5 % | 5 % | 100 —103 | 100 —103 | .. | .. | .. | 4 17 |

## ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 320,000 | Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007 | 5 | 8 % | 8 % | 8 % | .. | 8 3/16— 8 5/16 | 8½— 8⅝ | 8 5/16 | 8 3/16 | + 1/16 | 4 15 6 |
| 260,007 | Do. 6 % Cum. Prefs., 1 to 260,007 .. | 5 | 5½% | 5½% | 5½% | .. | 6 — 6½ | 6 — 6½ | 6 1/16 | 6⅛ | .. | 4 8 0 |
| 266,600 | Do. Permanent, 6 % Deb. Stock, 1888 | 100 | 6 % | 6 % | 6 % | .. | 129 —132 | 129 —134 | .. | .. | .. | 4 10 11 |
| 286,100 | Auckland E. Trams, 5 % 1st Mort. Deb. Stock .. | 100 | 5 % | 5 % | 5 % | .. | 103 —106 | 103 —106 | .. | .. | .. | 4 14 4 |
| 580,000 | Babcock & Wilcox, 1 to 580,000 .. .. .. | 1 | 20 % | 20 % | 20 % | .. | 3½— 3¾ | 3⅜— 3 7/16 | 7s/6 | .. | + ⅛ | 5 3 11 |
| 100,000 | Do. do. 6 % Cum. Pref., 1 to 100,000 .. | 1 | 6 % | 6 % | 6 % | .. | 1 1/16— 1 1/16 | 1 1/16— 1 1/16 | .. | .. | .. | 5 16 10 |
| 40,000 | British Aluminium, Ord., 1 to 40,000 .. .. | 5 | 7 % | 7 % | 7 % | .. | 3¾— 4¼ | 3¾— 4¼ | .. | .. | .. | 7 15 7 |
| 40,000 | Do. do. 7 % Cum. Pref. .. .. .. | 5 | 7 % | 7 % | 7 % | .. | 4¾— 5¼ | 4¾— 5¼ | 80/- | .. | .. | 6 13 4 |
| 20,000 | Do. do. "A" 6 % Cum. Pref. .. .. | 5 | 6 % | 6 % | 6 % | .. | 5 — 5⅜ | 5⅛— 5⅜ | 97/6 | .. | + ⅛ | 5 6 8 |
| 20,000 | Do. do. 4 % Funding Certs. .. .. | 5 | 4 % | 4 % | 4 % | .. | 3¾— 4¼ | 3¾— 4¼ | .. | .. | .. | 4 14 1 |
| 238,200 | Do. do. 5 % 1st Mort. Deb. Stock Red. | Stock | 5 % | 5 % | 5 % | .. | 100 —103 | 100 —103 | .. | .. | .. | 5 13 5 |
| 800,000 | Do. do. 5½ % Loch Leven Debs. .. | 100 | .. | .. | 5½% | 5½% | 96 — 99 xd | 97 —100 | 98½ | 98 | .. | 5 10 0 |
| 400,000 | British Columbia E. Rail Def. Ord. Stock .. .. | 100 | 6 % | 6 % | 6 % | .. | 127 —130 | 127 —130 | .. | .. | .. | 4 12 4 |
| 800,000 | Do. 5 % Pref. Ord. Stock .. .. .. | 100 | 5 % | 5 % | 5 % | .. | 106 —110 | 106 —110 | 109 | .. | .. | 4 13 6 |
| 800,000 | Do. 5 % Cum. Perp. Pref. Stock .. .. | 100 | 5 % | 5 % | 5 % | .. | 104 —107 | 104 —107 | .. | .. | .. | 4 14 4 |
| 235,000 | Do. 4½ % 1st Mort. Debs., 1 to 6,250 .. .. | 40 | 4½% | 4½% | 4½% | .. | 101 —104 | 101 —104 | .. | .. | .. | 4 6 7 |
| 220,000 | Do. 4½ % Vancouver Power Debs., 1 to 2,200 | 100 | 4½% | 4½% | 4½% | .. | 101 —103 | 100 —103 | 100½ | 100 | .. | 4 7 5 |
| 183,301 | British Electric Traction .. .. .. .. | 10 | 6 % | 3 % | Nil | .. | 1½— 1⅝ | 1½— 1⅝ | .. | .. | .. | Nil |
| 161,437 | Do. do. 6 % Cum. Pref. .. .. .. | 10 | 6 % | 6 % | 6 % | .. | 4¾— 5¼ | 4⅝— 5¼ | 98/9 | 98/9 | — ⅛ | 11 14 2 |
| 1,448,653 | Do. do. 5 % Perp. Deb. Stock .. | Stock | 5 % | 5 % | 5 % | .. | 96 —100 | 97 - 10. | 99½ | 98½ | +1 | 4 19 0 |
| 410,178 | Do. do. 4½ % 2nd Deb. Stock Red. | 100 | 4½% | 4½% | 4½% | .. | 72 — 76 | 72 — 76 | 75 | 74½ | .. | 5 18 5 |
| 100,000 | British Insulated and Helsby Cables .. .. | 5 | 8 % | 8 % | 10 % | .. | 6⅝— 7⅛ | 6⅝— 7⅛ | 7 | .. | .. | 7 0 4 |
| 100,000 | Do. do. 6 % Cum. Pref. .. .. .. | 5 | 6 % | 6 % | 6 % | 6 % | 5⅝— 6 | 5⅝— 6 | .. | .. | .. | 5 0 0 |
| 500,000 | Do. do. 4½ % 1st Mort. Deb. Red... | 100 | 4½% | 4½% | 4½% | 4½% | 101 —104 | 101 —104 | .. | .. | .. | 4 6 7 |
| 212,000 | British Thomson-Houston 4½ % 1st Mort. Debs. .. | 100 | 4½% | 4½% | 4½% | .. | 85 — 89 | 85 — 89 | .. | .. | .. | 4 18 11 |
| 400,000 | British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000 | 5 | Nil | Nil | Nil | .. | ⅛— ⅞ | ⅛— ⅞ | .. | .. | .. | Nil |
| 1,016,353 | Do. do. 4 % Mort. Deb. Stock .. | 100 | 4 % | 4 % | 4 % | .. | 42 — 47 | 43 — 48 | 45½ | 45⅛ | + 1 | 9 7 6 |
| 50,000 | ‡ Browett, Lindley & Co., Ord. .. .. .. .. | 1 | Nil | Nil | Nil | .. | 7/16— 11/16 | 7/16— 11/16 | .. | .. | .. | Nil |
| 50,000 | ‡ Do. do. 6 % Cum. Pref. .. .. | 1 | Nil | Nil | Nil | .. | 14/6 to 15/6 | 14/6 to 15/6 | .. | .. | .. | Nil |
| 105,731 | Brush Electrical Engineering, Ord., 1 to 105,731 .. | 2 | Nil | 2½% | Nil | .. | 0 — ⅛ | 0— ⅛ | .. | .. | .. | Nil |
| 150,000 | Do. do. Non-cum. 6 % Pref... .. | 2 | 6 % | 6 % | Nil | .. | 3/16— 5/16 | 3/16— 5/16 | .. | .. | .. | Nil |
| 125,000 | Do. do. 4½ % Perp. Deb. Stock | Stock | 4½% | 4½% | 4½% | .. | 79 — 82 | 79 — 82 | 79½ | .. | .. | 5 9 9 |
| 125,000 | Do. do. 4½ % Perp. 2nd Deb. Stock.. | Stock | 4½% | 4½% | 4½% | .. | 63 — 66 | 63 — 66 | .. | .. | .. | 6 16 4 |
| 100,000 | Buenos Ayres & Belgrano, 1 to 100,000 .. .. | 5 | 4 % | 3 % | 3 % | .. | 4⅜— 4⅝ | 4⅜— 4⅝ | .. | .. | .. | 3 1 6 |
| 40,000 | Do. do. "A" 6 % Cum. Pref., 1 to 40,000 | 5 | 6 % | 6 % | 6 % | 6 % | 4⅜— 5⅛xd | 4⅜— 5⅛ | .. | .. | .. | 5 17 1 |
| 27,500 | Do. do. "B" do., 1 to 27,500 .. .. | 5 | 6 % | 6 % | 6 % | 6 % | 4⅜— 5⅛xd | 4⅜— 5⅛ | .. | .. | .. | 5 17 1 |
| 310,000 | Do. do. 5 % Deb. Stock .. .. .. | 100 | 5 % | 5 % | 5 % | 5 % | 110 —116 | 110 —116 | 110 | .. | .. | 4 6 2 |
| 190,000 | Do. do. 5 % 2nd Deb. Stock .. .. | 100 | 5 % | 5 % | 5 % | 5 % | 102 —105 | 102 —105 | .. | .. | .. | 4 15 3 |
| 137,610 | Calcutta Trams, 1 to 137,610 .. .. .. .. | 5 | 8 % | 8 % | 8 % | .. | 6⅞— 7⅛ | 6⅞ — 7⅛ | 6⅞ | .. | .. | 5 8 6 |
| 30,000 | Do. 5 % Cum. Pref., Nos. 1 to 29,330.. | 5 | .. | 5 % | 5 % | .. | 5 — 5⅜ | 5 — 5⅜ | 5 1/16 | 5 1/16 | .. | 4 13 0 |
| 350,000 | Do. 4½ % 1st Deb. Stock.. .. .. | 100 | 4½% | 4½% | 4½% | .. | 101 —105 | 101 —105 | .. | .. | .. | 4 5 9 |
| 35,000 | Callender's Cable Construction shares .. .. | 5 | 12½% | 15 % | 15 % | .. | 11 — 12 | 11 — 12 | 11¼ | .. | .. | 4 5 0 |
| 40,000 | Do. do. 5 % Cum. Pref. .. .. .. | 5 | 5 % | 5 % | 5 % | .. | 5⅜— 5⅝ | 5⅜— 5⅝ | .. | .. | .. | 6 5 1 |
| 300,000 | Do. do. 4½ % 1st Mort. Deb. Stock Red. | Stock | 4½% | 4½% | 4½% | .. | 106 —108 | 106 —108 | .. | .. | .. | 4 4 1 |
| 491,222 | Cape E Trams., 1 to 491,222 .. .. .. .. | 1 | 5 % | Nil | Nil | .. | 1/16— 1/16 | 1/16— 1/16 | .. | .. | .. | Nil |
| 450,000 | Castner-Kellner Alkali, 1 to 450,000 .. .. .. | 1 | 4 % | 6 % | 8 % | .. | 1½— 1¾ | 1½— 1¾ | 26/3 | .. | .. | 5 13 4 |
| 215,045 | Do. do. 4½ % 1st Mort. Deb. Stock | 100 | 4½% | 4½% | 4½% | 4½% | 100 —103 | 100 —103 | .. | .. | .. | 4 7 5 |
| 1,893,610 | Central London Railway, Ord. Stock.. .. .. | Stock | 4 % | 4 % | 4 % | 3 % | 65 — 68 xd | 64 — 67 | 66½ | 64 | —1 | 4 9 7 |
| 553,195 | Do. do. 4 % Pref. Stock .. .. | Stock | 4 % | 4 % | 4 % | 4 % | 82 — 84 xd | 82 — 84 | .. | .. | .. | 4 15 3 |
| 553,195 | Do. do. Def. do. .. .. | Stock | 4 % | 4 % | 4 % | 2 % | 44 — 47 xd | 44 — 47 | 46½ | 44½ | .. | 4 5 1 |
| 1,480,000 | City and South London Railway .. .. .. | Stock | 2½% | 1⅞% | 2½% | 2½% | 38 — 40 xd | 38 — 40 | 39½ | 38½ | .. | 5 0 8 |

* Unless otherwise stated, all shares are fully paid. ‡ A period of nine months. ‖ From Manchester Share List.

Continued on next page.

## SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

### ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

| Present Issue. | NAME. | Stock or Share. | Dividends for the last four years. | | | | Closing Quotations Feb. 18th. | Closing Quotations Feb. 25th. | Business done week ended Feb. 25th, 1908. | | Rise + or Fall — | Present Yield per cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | * | 1904. | 1905. | 1906. | 1907. | | | Highest | Lowest. | | £ s. d. |
| 85,000 | Crompton & Co., Nos. 1 to 85,000 | S | 2½% | 2½% | 5 % | .. | 1⅞ — 2⅛ | 1⅞ — 2⅛ | 37/6 | .. | .. | 7 0 4 |
| 100,000 | Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red. | .. | 5 % | 5 % | 5 % | .. | 92 — 95 | 92 — 95 | .. | .. | .. | 5 5 8 |
| 260,000 | Dick, Kerr & Co., 1 to 260,000 | 1 | 10 % | 10 % | 10 % | .. | 1 — 1⅛ | 1 — 1⅛ | .. | .. | .. | 8 0 0 |
| 305,000 | Do. do. 6 % Cum. Pref., 1 to 305,000 | 1 | 6 % | 6 % | 6 % | .. | 1 — 1⅛ | 1 — 1⅛ | .. | .. | .. | 4 16 0 |
| 282,580 | Do. do. 4½ % Deb. Stock | 100 | 4½% | 4½% | 4½% | .. | 99 —102 | 99 —102 | .. | .. | .. | 4 8 3 |
| 60,000 | Dublin United Trams. (1896), 1 to 60,000 | 10 | 6 % | 6% | 6 % | 6½% | 12½ — 13½ | 12½ — 13½ | .. | .. | .. | 4 18 2 |
| 59,987 | Do. 6 % Pref. between 1 and 60,000 | 10 | 6 % | 6 % | 6 % | 6 % | 12½ — 13½ xd | 12½ — 13½ | .. | .. | .. | 4 7 3 |
| 99,261 | Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261 | 5 | 2½% | 4½% | 4½% | .. | ⅞ — 1 | ⅞ — 1 | .. | .. | .. | 12 10 0 |
| 17,139 | Do. "A" shares, 01—017,139 | 5 | 2½% | 4½% | 4½% | .. | 1⅛ — 2⅜ | 1⅛ — 2⅜ | .. | .. | .. | 8 6 9 |
| 319,475 | Do. 4 % Deb. Stock Red. | 100 | 4 % | 4 % | 4 % | .. | 78 — 81 | 78 — 81 | 79 | .. | .. | 4 18 9 |
| 72,220 | Do. 5 % 2nd Deb. Stock Prov. Certs. all pd. | 100 | 5 % | 5 % | 5 % | .. | 87 — 90 | 87 — 90 | .. | .. | .. | 5 11 1 |
| 112,100 | Electric Contruction, 1 to 112,100 | 2 | Nil | Nil | Nil | .. | 3/16 — 5/16 | 1/4 — 1/2 | .. | .. | —1/16 | Nil |
| 31,390 | Do. do. 7 % Cum. Pref., 1 to 31,390 | 2 | 7 % | 7 % | Nil | .. | 1⅛ — 1⅜ | 1⅛ — 1⅜ | .. | .. | .. | Nil |
| 25,000 | General Electric Co. (1900), 5 % Cum. Pref. | 10 | 5 % | 5 % | 5 % | .. | 7⅞ — 8¼ | 7⅞ — 8¼ | .. | .. | .. | 6 1 3 |
| 200,000 | Do. do 4 % Mort Deb. | Stock | 4 % | 4 % | 4 % | .. | 89 — 92 | 89 — 92 | .. | .. | .. | 4 19 11 |
| 78,000 | Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000 | 10 | 4 % | 4 % | 4 % | .. | 1¼ — 1⅝ | 1¼ — 1⅝ | .. | .. | .. | 17 15 6 |
| 96,000 | Greenwood & Batley, 7 % Cum. Pref. | 10 | 7 % | 7 % | 7 % | .. | 10¼ — 10⅝ | 10¼ — 10⅝ | .. | .. | .. | 6 10 8 |
| 80,000 | Do. do. 5 % Mort. Debs. | 100 | 5 % | 5 % | 5 % | .. | 102 —103 | 102 —103 | .. | .. | .. | 4 17 1 |
| 40,000 | Henley's (W. T.), Telegraph Works, Ord. | 5 | 15 % | 15% | 15 % | 15% | 11⅜ — 12⅜ | 11⅜ — 12⅜ | .. | .. | .. | 5 12 7 |
| 40,000 | Do. do. 4½ % Pref. | 5 | 4½% | 4½% | 4½% | 4½% | 5 — 5½ | 5 — 5½ | .. | .. | .. | 3 17 3 |
| 150,000 | Do. do. 4½ % Mort. Deb. Stock | Stock | 4½% | 4½% | 4½% | 4½% | 106 —108 | 106 —108 | .. | .. | .. | 4 3 4 |
| 50,000 | India-Rubber, Gutta-percha & Telegraph Works | 10 | 5 % | 10% | 10 % | .. | 15 — 16 | 15½ — 16½ | .. | .. | + ½ | 6 3 1 |
| 37,500 | †Liverpool Overhead Railway, Ord. | 10 | 1½% | Nil | Nil | ½% | 1⅜ — 1½ | 1⅜ — 1⅝ | .. | .. | .. | Nil |
| 10,000 | † Do. do. Pref., fully paid | 10 | 5 % | 5 % | 5 % | 5 % | 7½ — 7⅞ | 6½ — 7⅞ | .. | .. | — ½ | 6 9 0 |
| 600,070 | London United Trams. (1901), 1 to 50,007 | 10 | 6 % | 8 % | 8 % | .. | 6½ — 6⅝ | 6½ — 6⅝ | .. | .. | .. | 4 8 11 |
| 899,980 | Do. do. 60,008 to 100,000 | 10 | 6 % | 8 % | 8 % | .. | 6½ — 6⅝ | 6½ — 6⅝ | .. | .. | .. | 4 8 11 |
| 125,000 | Do. do. 5 % Cum. Pref., 1 to 125,000 | 10 | 5 % | 5 % | 5 % | .. | 7⅞ — 8 | 7 — 8 | .. | .. | — ½ | 5 17 8 |
| 1,321,000 | Do. do. 4 % 1st Mort. Deb. Stock | 100 | 4 % | 4 % | 4 % | .. | 81 — 85 | 81 — 85 | 83½ | 82½ | .. | 4 14 2 |
| 5,732,062 | Metropolitan Consolidated | 100 | 3 % | 2⅜% | 1 % | ½% | 37 — 38 | 37 — 38 | 37⅞ | 37 | .. | 1 6 4 |
| 2,640,914 | Do. Surplus Lands | 100 | 2⅜% | 2⅜% | 2⅜% | 2⅜% | 65 — 67 | 65 — 67 | 66½ | 65⅜ | .. | 4 2 1 |
| 8,235 000 | Do. District | 100 | Nil | Nil | Nil | Nil | 10½ — 11½ | 10½ — 11½ | 11½ | 10¾ | .. | Nil |
| 314,016 | Metropolitan Electric Trams., Defd. | 1 | Nil | Nil | Nil | .. | 3/16 — 5/16 | 3/16 — 7/16 | .. | .. | .. | Nil |
| 500,000 | Do. do. 5 % Cum. Pref. | 1 | 5 % | 5 % | 5 % | 5 % | 15/16 — 1 xd | 15/16 — 1 1/16 | 16/3 | .. | .. | 5 6 8 |
| 350,000 | Do. do. 4½ % Deb. Stock Red. | 100 | 4½% | 4½% | 4½% | 4½% | 94 — 97 | 98 —100 | 99 | .. | +3½ | 4 10 0 |
| 245,500 | Potteries E. Trc. | 1 | 5 % | 4 % | 4 % | .. | 1/16 — 3/16 | 1/16 — 3/16 | .. | .. | .. | 8 0 0 |
| 245,500 | Do. 5 % Cum. Pref. | 1 | 5 % | 5 % | 5 % | .. | 1/16 — 3/16 xd | 1/16 — 3/16 | .. | .. | .. | 6 13 4 |
| 245,000 | Do. 4½ % Deb. Stock | 100 | 4½% | 4½% | 4½% | .. | 93 — 96 | 93 — 96 | .. | .. | .. | 4 13 9 |
| 37,350 | Telegraph Construction and Maintenance | 12 | 15 % | 15 % | 15 % | 17½% | 33 — 35 | 33 — 35 | 33⅜ | .. | .. | 6 0 8 |
| 150,000 | Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909 | 100 | 4 % | 4 % | 4 % | 4 % | 100 —103 | 100 —103 | .. | .. | .. | 3 17 8 |
| 3,599,200 | Undergd. E. R., Lon., 5 % Profit Shar. S. Nts. | .. | 5 % | 5 % | 5 % | .. | 45 — 49 | 42 — 45 | .. | .. | —3½ | 11 2 2 |
| 66,666 | Willans & Robinson, 1 to 30,000 & 30,001 to 116,666 | 1 | Nil | Nil | Nil | 5 %§ | 1 — 1⅛ | 1 — 1⅛ | 25/- | 23/9 | .. | 6 13 4 |
| 66,666 | Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666 | 5 | Nil | Nil | .. | 6 % | 3½ — 3¾ | 3½ — 3¾ | .. | .. | .. | 8 0 0 |
| 946,404 | Do. 4 % 1st Mort. Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 72 — 77 | 72 — 77 | 74 | 72½ | .. | 5 1 3 |

### ELECTRICITY SUPPLY COMPANIES.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15,000 | Bromley (Kent) E.L. & P,. 1 to 15,000 | 5 | 5⅛% | 5⅛% | 5⅛% | .. | 4⅝ — 5⅛ | 4⅝ — 5⅛ | .. | .. | .. | 5 7 4 |
| 70,000 | Do. do. 4½ % 1st. deb. stock | 100 | 4½% | 4½% | 4½% | .. | 95 — 98 | 95 — 98 | .. | .. | .. | 4 11 10 |
| 30,131 | Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000 | 5 | 10 % | 10 % | 10% | 10 % | 7 — 8 | 7⅛ — 8⅛ | .. | .. | + ⅛ | 6 17 8 |
| 9,869 | Do. do. 7 % Cum. Pref. | 5 | 7 % | 7 % | 7 % | 7 % | 7 — 8 | 7 — 8 | .. | .. | .. | 4 7 6 |
| 336,876 | Central Electric Supply 4 % Guar. Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 97 — 100 | 97 —100 | .. | .. | .. | 4 0 0 |
| 80,000 | Charing Cross and Strand Electricity Supply | 5 | 8 % | 5 % | 5 % | 5 % | 4⅜ — 4⅝ | 4⅜ — 4⅝ | 90/- | 88/9 | .. | 5 2 7 |
| 80,000 | Do. do. 4½ % Cum. Pref. | 5 | 4½% | 4½% | 4½% | 4½% | 4⅜ — 4⅝ xd | 4⅜ — 4⅝ | .. | .. | .. | 4 10 0 |
| 80,000 | Do. "City Undertaking" 4½ % Cum. Prf. | 5 | 4½% | 4½% | 4½% | 4½% | 4⅜ — 4⅝ | 4⅜ — 4⅝ | 91/3 | 88/9 | .. | 4 12 4 |
| 445,736 | Do. do. 4 % Deb. Stock Red. | 100 | 4 % | 4 % | 4 % | 4 % | 97 —100 | 97 —100 | 97½ | .. | .. | 4 0 0 |
| 49,436 | Chelsea Electricity Supply, Ord. | 5 | 6 % | 6 % | 4½% | .. | 3⅜ — 4⅛ | 3⅜ — 4⅛ | .. | .. | .. | 5 5 11 |
| 175,000 | Do. do. 4½ % Deb. Stock Red. | Stock | 4½% | 4½% | 4½% | .. | 101 —104 | 101 —104 | .. | .. | .. | 4 6 7 |
| 70,595 | City of London Elec. Lighting, Ord. 40,001—110,595 | 10 | 6 % | 6 % | 6 % | 6 % | 10 — 11 | 10 — 11 | 10 7/16 | .. | .. | 5 9 1 |
| 40,000 | Do. 6 % Cum. Pref., 1 to 40,000 | 10 | 6 % | 6 % | 6 % | 6 % | 11½ — 12½ | 11½ — 12½ | .. | .. | .. | 4 16 0 |
| 400,000 | Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd. | .. | 5 % | 5 % | 5 % | 5 % | 122 —125 | 122 —125 | .. | .. | .. | 4 0 0 |
| 800,000 | Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd. | 100 | 4½% | 4½% | 4½% | 4½% | 99 —102 | 99 —102 | 100⅜ | 99⅜ | .. | 4 8 3 |
| 40,000 | County of Durham Electrical Power, Ord. | 5 | £3 7 0 | 4 % | 4 % | .. | 3¾ — 4 | 3 — 3⅜ | .. | .. | — ¼ | 5 6 8 |
| 50,000 | Do. do. do. 5 % Pref. | 5 | 5 % | 5 % | 5 % | .. | 4⅜ — 4⅝ | 4⅜ — 4⅝ | .. | .. | .. | 6 5 0 |
| 40,000 | County of London Electric Lighting, Ord. 1—40,000 | 10 | 4½% | 5 % | 5 % | 5 % | 7⅞ — 8 | 7⅞ — 8 | .. | .. | .. | 5 6 8 |
| 40,000 | Do. do. 6 % Pref., 40,001—60,000 | 10 | 6 % | 6 % | 6 % | 6 % | 11⅜ — 11⅝ | 11 — 11½ | 11⅜ | .. | — ⅛ | 5 4 4 |
| 400,000 | Do. do. 4½ % Deb. Stock | .. | 4½% | 4½% | 4½% | 4½% | 105 —108 | 105 —108 | .. | .. | .. | 4 10 11 |
| 400,000 | Do. do. 4½ % 2nd. Deb. Stock | Stock | 4½% | 4½% | 4½% | 4½% | 96 — 99 | 96 — 99 | 98½ | .. | .. | 4 10 11 |
| 80,000 | Edmundson's Electric Corporation, Ord. Shares | 5 | 7 % | 4 % | Nil | .. | 1/16 — 3/16 | 1/16 — 3/16 | .. | .. | .. | 11 0 0 |
| 80,000 | Do. do. 6 % Cum. Pref. | 5 | 6 % | 6 % | 3 % | .. | 1/2 — 1⅝ | 1/2 — 1⅝ | .. | .. | .. | 10 0 0 |
| 433,000 | Do. do. 4½ % 1st Mort. Deb. Stk. | 100 | 4½% | 4½% | 4½% | .. | 70 — 80 | 70 — 80 | .. | .. | .. | 5 12 6 |
| 10,000 | Folkestone, 1 to 10,000 | 5 | 5½% | 5½% | 5½% | .. | 4⅝ — 5⅛ | 4⅝ — 5⅛ | .. | .. | .. | 5 7 4 |
| 10,000 | Do. 5 % Cum. Pref., 1 to 10,000 | 5 | .. | 5 % | 5 % | .. | 5 — 5⅛ | 5 — 5⅛ | .. | .. | .. | 4 10 11 |
| 90,000 | Do. 4½ % 1st Deb. Stock | 100 | 4½% | 4½% | 4½% | .. | 94 — 97 | 94 — 97 | .. | .. | .. | 4 12 9 |
| 15,000 | Hove, 1 to 15,000 | 5 | 8½% | 9 % | 9 % | .. | 6½ — 6⅝ | 6½ — 6⅝ | .. | .. | .. | 6 13 4 |
| 21,000 | Kensington and Knightsbridge Electric Ord. | 5 | 12 % | 10 % | 10 % | .. | 8 — 9 | 8 — 9 | .. | .. | .. | 5 11 1 |
| 90,000 | Do. do. do. 4 % Deben. Stk. | Stock | 4 % | 4 % | 4 % | 4 % | 95 — 98 | 95 — 98 | .. | .. | .. | 4 1 2 |
| 10,000 | London Electric Supply Corporation, Limited, Ord. | 3 | 3 % | 4 % | 4 % | 2½% | 1½ — 1⅝ | 1⅜ — 1⅝ | .. | .. | .. | 6 16 8 |
| 70,000 | Do. do. do. 6 % Pref. | 5 | 6 % | 6 % | 6 % | 6 % | 4⅜ — 5⅛ | 4⅜ — 5⅛ | .. | .. | .. | 6 3 1 |
| 374,395 | Do. do. 4 % 1st Mort. Deb. Stk. Red. | Stock | 4 % | 4 % | 4 % | 4½% | 91 — 93 | 91 — 93 | 91½ | 90½ | .. | 5 4 0 |
| 200,000 | Metropolitan Electric Supply, 1 to 100,000 | 5 | 10 % | 10 % | 8 % | 6½% | 5⅜ — 6⅛ | 5⅜ — 6⅛ | .. | .. | .. | 6 8 0 |
| 76,121 | Do. 4½ % Cum. Pref. 1—71,106 | 5 | 4½% | 4½% | 4½% | 4½% | 4⅜ — 5⅛ | 4⅜ — 5⅛ | .. | .. | .. | 4 3 9 |
| 220,000 | Do. 4½ % 1st Mort. Deben. Stock | .. | 4½% | 4½% | 4½% | 4½% | 106 —110 | 107 —111 | 109½ | .. | +1 | 4 1 1 |
| 250,000 | Do. 3½ % Mort. Deben. Stock Redem. | Stock | 3½% | 3½% | 3½% | 3½% | 85 — 90 | 85 — 90 | .. | .. | .. | 3 17 9 |
| 250,000 | Midland Electric Corporation, 4½ % 1st Mort. Deb. | 100 | 4½% | 4½% | 4½% | .. | 98 —101 | 98 —101 | .. | .. | .. | 4 9 1 |
| 87,500 | Newcastle-on-Tyne, 1 to 87,500 | 5 | 8 % | 8 % | 8 % | .. | 6½ — 6⅝ | 6¼ — 6⅜ | .. | .. | .. | 5 18 6 |
| 87,500 | Do. 5 % Pref., 1 to 87,500 | 5 | 5 % | 5 % | 5 % | .. | 5 — 5⅛ | 5 — 5⅛ | .. | .. | .. | 4 10 11 |
| 10,852 | Notting Hill Electric Lighting | 10 | 7 % | 7½% | 7½% | .. | 11½ — 12½ | 11½ — 12½ | .. | .. | .. | 5 17 8 |
| 20,000 | Oxford, 1 to 96 and 407 to 20,310 | 5 | 7 % | 7 % | 7 % | 7 % | 5⅝ — 6⅛ | 5⅝ — 6⅛ | .. | .. | .. | 5 12 0 |
| 50,000 | Do. 4 % Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 93 — 95 | 93 — 95 | .. | .. | .. | 4 4 3 |
| 40,000 | St. James' and Pall Mall Electric Light, Ord. | 5 | 14½% | 12½% | 10 % | 10 % | 7⅞ — 8⅛ | 7⅞ — 8⅛ | 8⅛ | 8 1/16 | .. | 5 14 3 |
| 20,000 | Do. do. 7 % Pref. 20,081 to 40,080 | 5 | 7 % | 7 % | 7 % | 7 % | 6½ — 7⅛ | 6½ — 7⅛ | .. | .. | .. | 4 16 7 |
| 150,000 | Do. do. 3½ % Deb. Stock Red. | 100 | 3½% | 3 % | 3½% | 3½% | 85 — 90 | 85 — 90 | .. | .. | .. | 3 17 9 |
| 12,000 | Smithfield Markets Electric Supply, Ord. | 5 | 4 % | 4 % | Nil | Nil | ⅛ — 1⅛ | ⅛ — 1⅛ | .. | .. | .. | Nil |
| 50,000 | Do. do. do. 4 % Deb. Stock | Stock | 4 % | 4 % | 4 % | 4 % | 70 — 74 | 70 — 74 | .. | .. | .. | 5 8 1 |
| 65,000 | South London Electricity Supply, Ord. | 5 | 4 % | 4 % | 3 % | .. | 2½ — 3 | 2 — 3 | .. | 55/- | — ¼ | 5 0 0 |
| 120,000 | South Met. Elec. Lt. & Power, Ord. | 1 | Nil | 2½% | 2½% | .. | ⅜ — ½ | ⅜ — ½ | .. | .. | .. | 3 6 8 |
| 117,968 | Do. do. 7 % Pref. | 1 | 7 % | 7 % | 7 % | .. | 1⅛ — 1⅜ | 1⅛ — 1⅜ | .. | .. | .. | 3 14 8 |
| 200,000 | Do. do. 4½ % 1st Deb. Stk. | 100 | 4½% | 4½% | 4½% | .. | 101 —104 | 101 —104 | .. | 102 | .. | 4 6 7 |
| 80,000 | Urban Electric Supply, Ord. | 5 | 5 % | 5 % | 5 % | .. | 1½ — 2½ | 1½ — 2½ | .. | .. | .. | 12 10 0 |
| 50,000 | Do. do. 5 % Cum. Pref. | 5 | 5 % | 5 % | 5 % | .. | 2 — 2½ | 2 — 2½ | .. | .. | .. | 10 0 0 |
| 200,000 | Do. do. 4½ % 1st Mort. Db. Stk. Red. | 100 | 4½% | 4½% | 4½% | .. | 90 — 93 | 90 — 93 | .. | .. | .. | 4 16 9 |
| 110,000 | Westminster Electric Supply, Ord. | 5 | 14 % | 13 % | 12 % | 10 % | 8 — 9 | 8 — 9 | 9½ | 8½ | .. | 5 11 1 |
| 81,979 | Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905) | 5 | 5 % | 5 % | 4½% | 4½% | 5 — 5⅓ | 5 — 5⅓ | .. | .. | .. | 4 1 10 |

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. § Interim Dividend.

Bank rate of Discount 4 per cent. January 23rd. 1908.

# EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING JANUARY, 1908.

In contradistinction to the December returns of electrical business, those for January are almost noteworthy. The exports of home goods, which stand at £203,945 in value, constitute a record only approached once in the past three years (in November, 1906), while the importation of foreign goods, curiously enough, shows a great decrease in value, totalling only £119,770, the lowest figure recorded since September, 1905.

Compared with the preceding month, the exports show an improvement of nearly £50,000, and are some £36,000 in excess of the average of the preceding 12 months. The imports are approximately £27,000 and £35,000 respectively below last month's and the 1907 average totals. The re-exports continue their downward tendency, and at £11,174, are £1,800 less in value than in December.

The outstanding feature of the export columns is the large export of electrical machinery (£103,354), other sections, excepting tramway material, being well represented; the imports are generally low in all sections, telephonic imports, however, showing a slight increase compared with the December figures.

Commencing with this return, carbons, electric glow lamps, arc lamps, searchlights, &c., primary and secondary batteries (which could, hitherto, be entered alternatively as "electrical goods"), are now given under their representative headings.

## Registered Exports of British and Irish Electrical Goods from the United Kingdom.*

| Country receiving exports and importing. | Electrical goods and appliances. | Electrical cable. | Electric lighting fittings and accessories. | Electric lamps. | Electric meters and instruments. | Electric machinery. | Batteries and accumulators. | Carbons. | Telegraph and telephone material, and electric bells. | Electrically-driven machinery. | Tramways apparatus and materials. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
| Sweden, Norway and Denmark ... ... | 120 | 957 | 130 | 118 | 85 | 10,926 | 185 | ... | 176 | ... | ... | 12,697 |
| Germany ... ... ... ... ... ... | 249 | 1,120 | 91 | 63 | ... | 239 | ... | ... | 22 | ... | ... | 1,784 |
| Netherlands ... ... ... ... ... | 226 | 235 | 159 | 13 | 26 | 370 | ... | ... | ... | ... | ... | 1,029 |
| Belgium ... ... ... ... ... ... | 283 | 1,792 | 10 | 80 | 273 | 643 | 30 | ... | 676 | 15 | ... | 3,802 |
| France ... ... ... ... ... ... | 219 | ... | 417 | 516 | 54 | 2,672 | 54 | ... | ... | 117 | ... | 4,049 |
| Portugal, Madeira and Portuguese Africa ... | 23 | 201 | 52 | ... | ... | 5,072 | 151 | ... | 82 | 350 | ... | 5,931 |
| Spain and Canary Isles ... ... ... ... | 61 | ... | 32 | 29 | ... | 2,279 | ... | ... | ... | ... | ... | 2,401 |
| Italy and Austria-Hungary ... ... ... | 20 | 782 | 38 | 4 | ... | 852 | ... | ... | 432 | ... | ... | 2,128 |
| Greece and Turkey ... ... ... ... | ... | 2 | ... | ... | 13 | 1,878 | ... | ... | ... | ... | ... | 1,893 |
| Channel Isles, Gibraltar and Malta ... ... | 148 | 168 | 76 | 8 | ... | 505 | ... | ... | ... | ... | ... | 905 |
| U.S.A., Philippines and Cuba ... ... ... | 114 | ... | ... | 65 | 9 | 595 | 62 | ... | 10 | ... | ... | 855 |
| Canada and Newfoundland ... ... ... | 185 | 864 | 74 | ... | 4 | 676 | 38 | 4 | ... | ... | ... | 1,845 |
| British West Indies and British Guiana ... | 28 | ... | 14 | ... | 31 | 97 | 6 | ... | ... | ... | ... | 176 |
| Mexico, Venezuela and Panama ... ... | 1,069 | ... | 5 | 48 | ... | 1,736 | ... | ... | 95 | ... | ... | 2,953 |
| Peru and Uruguay ... ... ... ... | 14 | 13 | ... | ... | ... | 69 | 15 | 4 | 53 | ... | ... | 168 |
| Chile ... ... ... ... ... ... | 11 | 212 | 464 | ... | 290 | 1,797 | 45 | ... | 64 | ... | ... | 2,883 |
| Brazil ... ... ... ... ... ... | 321 | 155 | 117 | 84 | 337 | 4,852 | ... | ... | ... | 105 | ... | 5,971 |
| Argentine ... ... ... ... ... | 1,272 | 2,800 | 215 | 157 | 91 | 16,825 | 144 | 54 | 115 | ... | ... | 21,673 |
| Egypt and Tunis ... ... ... ... | 247 | 80 | 52 | 110 | 21 | 339 | ... | ... | ... | 21 | ... | 870 |
| British West Africa and St. Helena ... ... | 31 | 363 | ... | 8 | ... | 80 | ... | ... | 10 | ... | ... | 492 |
| Cape of Good Hope ... ... ... ... | 349 | 663 | 118 | 69 | 351 | 905 | 6 | 5 | 120 | ... | ... | 2,586 |
| Natal ... ... ... ... ... ... | 868 | 4,759 | 234 | 235 | 160 | 438 | 252 | 46 | 76 | 38 | ... | 7,106 |
| Zanzibar, Brit. East Africa, Mauritius & Aden | ... | 5 | 28 | 37 | ... | ... | 92 | ... | 56 | ... | ... | 218 |
| China and Siam ... ... ... ... ... | 1,512 | 2,575 | 917 | 231 | 517 | 17,398 | ... | ... | 4 | 520 | ... | 23,674 |
| Japan ... ... ... ... ... ... | 112 | 8,936 | 118 | 83 | 600 | 4,997 | 17 | ... | ... | ... | ... | 14,863 |
| India ... ... ... ... ... ... ... | 1,614 | 8,205 | 992 | 672 | 1,405 | 17,552 | 191 | 224 | 435 | 3,551 | ... | 34,841 |
| Burmah ... ... ... ... ... ... | 345 | 2,539 | 41 | 20 | ... | 147 | 19 | ... | ... | ... | ... | 3,111 |
| Ceylon ... ... ... ... ... ... | 350 | 84 | 105 | 29 | 12 | 472 | 193 | 4 | 28 | 23 | ... | 1,300 |
| Straits Settlements, Fed. Malay States and Labuan ... ... ... ... ... ... | 278 | 2,988 | 244 | 86 | 47 | 439 | 89 | ... | 32 | 293 | ... | 4,496 |
| Hong Kong ... ... ... ... ... | 74 | 193 | 29 | 23 | ... | 167 | ... | ... | 302 | 13 | ... | 801 |
| West Australia ... ... ... ... ... | 190 | 24 | 39 | 47 | ... | 153 | 38 | ... | 610 | ... | ... | 1,101 |
| South Australia ... ... ... ... ... | 784 | 1,271 | 47 | ... | ... | 179 | 174 | ... | 276 | ... | ... | 2,731 |
| Victoria ... ... ... ... ... ... | 397 | 5,090 | 378 | 64 | 223 | 297 | 164 | ... | 321 | ... | ... | 6,934 |
| New South Wales ... ... ... ... | 735 | 5,059 | 252 | 308 | 203 | 6,227 | 220 | 32 | 51 | 331 | ... | 13,418 |
| Queensland ... ... ... ... ... | 118 | 18 | 50 | 5 | ... | 71 | 127 | ... | ... | ... | ... | 399 |
| Tasmania ... ... ... ... ... | ... | 1,565 | 10 | ... | ... | 165 | ... | ... | 35 | ... | ... | 1,775 |
| New Zealand ... ... ... ... ... | 153 | 7,403 | 730 | 199 | 18 | 1,245 | 36 | ... | 101 | 201 | ... | 10,086 |
| Total, £ | 12,520 | 61,131 | 6,278 | 3,411 | 4,770 | 103,354 | 2,348 | 373 | 4,182 | 5,578 | ... | 203,945 |

## Registered Imports into the United Kingdom of Electrical Goods from all Countries.

| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Norway, Sweden and Denmark ... ... | 588 | 383 | 5 | 42 | ... | 616 | 178 | 34 | 2,837 | ... | ... | 4,683 |
| Germany ... ... ... ... ... ... | 220 | 5,406 | 85 | 11,176 | 575 | 15,842 | 831 | 1,049 | 2,372 | 200 | ... | 37,756 |
| Holland ... ... ... ... ... ... | 1,126 | 5,959 | 126 | 4,530 | 1,205 | 1,471 | 393 | 6,862 | 663 | 40 | ... | 22,375 |
| Belgium ... ... ... ... ... ... | 378 | 3,141 | 146 | 2,397 | 39 | 1,947 | 30 | 1,004 | 9,179 | 2,520 | ... | 20,781 |
| France ... ... ... ... ... ... | 67 | 2,464 | 745 | 1,230 | 1,946 | 713 | 422 | 2,541 | 3,603 | 5 | ... | 13,736 |
| Italy ... ... ... ... ... ... | ... | 35 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 35 |
| United States ... ... ... ... ... | 2,887 | 869 | 525 | 348 | ... | 10,043 | 34 | 57 | 41 | 4,761 | .. | 19,565 |
| Victoria and New South Wales ... ... | ... | ... | ... | ... | ... | 839 | ... | ... | ... | ... | ... | 839 |
| Total, £ | 5,266 | 18,257 | 1,632 | 19,723 | 3,765 | 31,471 | 1,888 | 11,547 | 18,695 | 7,526 | ... | 119,770 |

## Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Various countries, mainly as above ... ... | 2,322 | 3,588 | 819 | 386 | 27 | 1,925 | 39 | 254 | 1,139 | 675 | ... | ... |

Total Exports: £203,945 Total Re-Exports: £11,174 Total Imports: £119,770

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

* This section does not include telegraph cables and apparatus.

## A HANDY CURVE SHEET.

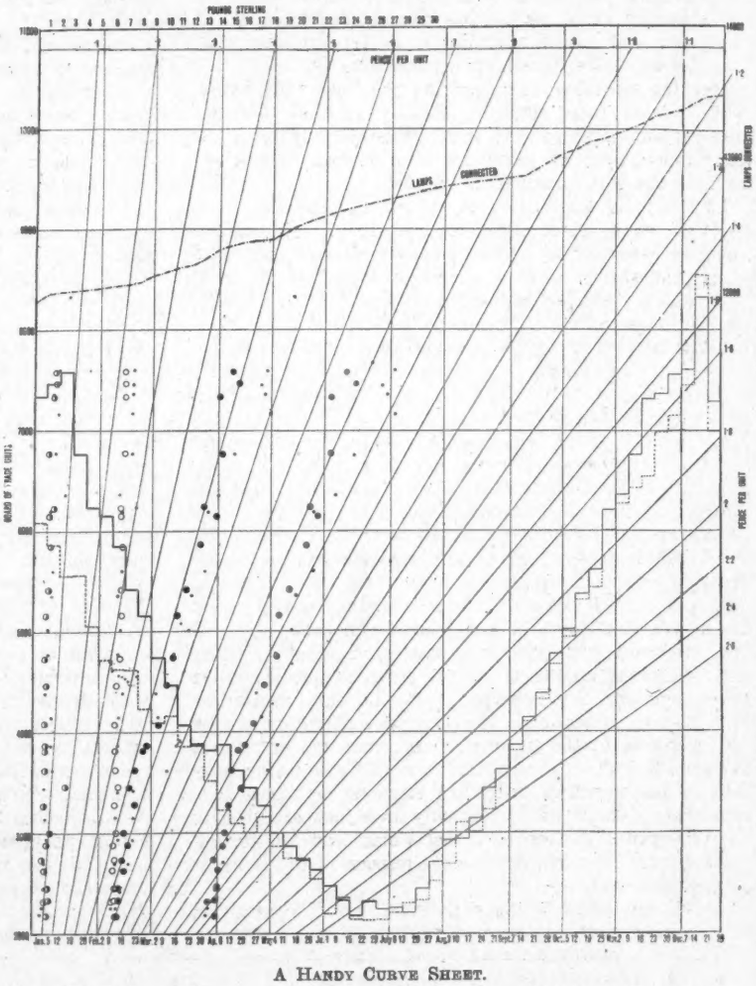
By JOHN B. MORGAN.

THE practice of plotting central-station outputs and costs in the form of curves is very general, and is undoubtedly an excellent way of showing the progress of the station and a means of checking the various items on the expenditure side of the year's balance-sheet. These curves are sometimes on one large sheet or in book form, but both these ways render it very difficult to compare the curves, owing to their number. The "units generated" curve is, of course, a very simple one to understand, but when the "cost curves" of the many items are looked into, their variations are not always so readily comparable. For instance, take the chief items of expenses of generation—coal &c., oil &c., labour and total cost. These four items are usually indicated by curves of pence per unit and pounds sterling per week, therefore a curve sheet to show the output and running costs would have nine curves in different colours, which if on one sheet would be rather intermixed, and if they were on separate leaves of a curve book it would require a deal of turning over to properly appreciate the comparative results. It fell to the writer's lot several years ago to keep the curve book of a central station, and realising the value of a simpler arrangement, with the help of another member of the staff a curve sheet was worked out which gave all the above figures in a much handier form. The writer has introduced this form of curve in several stations, and various central-station engineers who have seen it have adopted it. A brief description may therefore be of use to others who, like the writer, believe that a readily understood cost curve displayed in the engine room is an excellent inducement to all of the staff to promote economical running.

It was found possible to plot all the costs and output on a sheet of centimetre squared paper about 24 in. × 28 in., and it has been found that such a size will readily accommodate a very small or a very large station. The bottom horizontal or abscissa is divided into one centimetre per week (52 weeks); the left-hand vertical or co-ordinate is scaled for units generated, starting, say, a little lower than the previous year's lowest week's output, and going high enough to cover the estimated maximum weekly output at Christmas time.

The top horizontal is scaled from left to right in pounds sterling to cover the total costs for the week of heaviest expenditure. The oblique lines across the chart represent the pence per unit lines. The positions of these lines are obtained as follows:—Rule two lines across the chart at points corresponding to 2,400 units and 7,200 units, and on the 2,400-unit line mark off points where vertical lines from the pounds sterling scale intersect at £1, 2, 3, 4, 5, 6, 7, &c. This will give us points through which must pass the ·1, ·2, ·3, ·4, ·5, ·6, ·7, &c., pence per unit lines, viz., $\frac{£1 = 240d.}{2,400}$ = ·1d., $\frac{£2 = 480d.}{2,400}$ = ·2d. Repeat this on the line ruled from the 7,200-unit point, but in this case use intersecting lines from £3, 6, 9, 12, 15, 18, &c. This will give another set of points through which must pass the pence per unit lines, viz., $\frac{£3 = 720d.}{7,200 \text{ units}}$ = ·1d. Therefore, if a line is ruled from top to bottom of the chart to pass through the two ·1 points, it will represent ·1d. per unit for any given output, and similarly for the other decimals of a penny. It has been found convenient to rule the 1d. per unit line rather heavier than the others. The different items of the costs are indicated by means of different dots or circles. Thus, coal is represented by ●, labour by ○, oil, waste and stores by ◗, and total costs by ⊙.

The output curve is drawn as usual, except that it is better to draw it step fashion rather than by connecting up points. There will thus be a horizontal line, 1 centimetre long, corresponding to the figure for the week's output, over the space along the bottom scale corresponding to the particular week. Along this horizontal of output will be plotted the four dots so that they lie in line with this horizontal, but in perpendicular line with their respective costs as plotted from the top horizontal scale of pounds sterling. They are found to lie between the oblique lines




A HANDY CURVE SHEET.

of pence per unit, and their costs are easily seen. The chart illustrated is for 1907. It will be seen that the output for the week ending January 5th was 7,330 units, and on this horizontal are the four dots as above. For instance, the total costs were £22 12s.—Coal, £14 2s.; labour, £6 18s.; and oil and waste, £1 12s. These dots are found to be on the horizontal corresponding to the output, and lying under their corresponding amounts on the pounds sterling scale; the corresponding values in pence per unit are: Total costs ·735, coal ·46, labour ·23, oil, waste, &c., ·05.

It has been found convenient to do each half year in different colours, so that in the event of two weeks' output being the same the dots are readily allocated to their respective weeks. [The positions of the points for the second half-year are here indicated only by small dots.—EDS.] It is also handy to plot a curve (dotted) to

show the previous year's output and a lamps-connected curve can be easily added. I shall be pleased to give any help I can to any central-station engineer who wishes to start such a sheet.

## SUB-CONTRACTORS AND THE WORKMEN'S COMPENSATION ACT.

[BY OUR LEGAL CORRESPONDENT.]

AMONGST the many sections of the Workmen's Compensation Act, 1906, which are difficult to interpret, that which relates to sub-contracting takes a prominent place. It is one of the most important sections; for, by means of it, serious liabilities may be thrown upon an employer in respect of injuries to workmen not directly employed by him. When a man employs a certain number of workmen he knows exactly what risk he has to meet under the Act of 1906, and can insure accordingly; it is otherwise with liabilities which are thrown upon him indirectly.

Speaking generally, the underlying principle of the Act of 1906 is that there shall be liability only as between employer and employed. In other words, liability under the Act depends upon the existence of a contract of employment, be the same expressed or implied.

To this rule there is one important exception as a result of which an employer may be sued by a workman whom he has never seen, whose capacity and the nature of whose employment he does not know, and whose wages he never pays and cannot be made to pay.

This extraordinary exception is to be found in Sec. 4 of the Act, to the provisions of which we desire to call our readers' attention, having regard to the fact that many of them are either "sub-contractors" themselves or are in the habit of employing sub-contractors.

Sub-sec. (1) of this section provides that "Where any person (in this section referred to as the principal) in the course of, or for the purposes of, his trade or business, contracts with *any other person* (in this section referred to as the contractor), for the execution by or under the contractor of the whole or any part of any work undertaken by the principal, the principal shall be liable to pay to any workman employed in the execution of the work any compensation under this Act which he would have been liable to pay if that workman had been immediately employed by him; and where compensation is claimed from, or proceedings are taken against, the principal, then, in the application of this Act, references to the principal shall be substituted for references to the employer, except that the amount of compensation shall be calculated with reference to the earnings of the workman under the employer by whom he is immediately employed." The only important exception to the principle of this section is that a man providing thrashing or ploughing machinery is alone responsible for accidents arising from such user.

If this sub-section is taken by itself, it will be seen that it imposes a very heavy responsibility upon an employer. Though it is alleged to relate to sub-contracting and the risks of sub-contractors, it is important to observe that the terms "sub-contract" and "sub-contractor" are not used in it from beginning to end. Consequently it would appear that the workmen of any person who undertakes any work on behalf of a principal may prefer a claim against the principal. Thus, suppose a builder employs an electrician to wire a house for electric bells or electric light. Any wireman employed may claim compensation direct from the builder. That, of course, is a simple illustration; and, in view of the fact that the house in which the wiring is to be done is presumably occupied by and under the control of the builder, it is not altogether unreasonable that he should be held responsible.

It is necessary, however, to draw attention to the other sub-sections of Sec. 4, before its full importance can be accurately gauged. By Sub-sec. (2): "Where the principal is liable to pay compensation under this section, he shall be entitled to be indemnified by any person who would have been liable to pay compensation to the workman independently of this section, and all questions as to the right to and amount of such indemnity shall, in default of agreement, be settled by arbitration under this Act."

This section gives to the head employer the very doubtful remedy of proceeding against the "sub-contractor," who, in many instances, may be a man of straw against whom the enforcement of any remedy at law would be of no avail. The fact that he has the remedy should, however, draw the attention of the employer to the fact that when entering into a sub-contract, he will do well to provide that the sub-contractor shall insure his workmen, at any rate for the period during which the work is proceeding. Alternatively he should take the precautionary step of insuring them himself, and so shift what may be a very onerous burden on to other shoulders. Sub-sec. (3) provides that: "Nothing in this section shall be considered as preventing a workman recovering compensation under this Act from the contractor instead of the principal." Inasmuch as the principal is usually the person best able to meet a claim, it is not likely that this section will ever give much protection to members of his class.

Sub-sec. (4) of Sec. 4 is of considerable importance, inasmuch as it places an important limitation on the liability of the principal. It provides that: "This section shall not apply in any premises where the accident occurred elsewhere than on, or in or about, premises on which the principal has undertaken to execute work or which *are otherwise* under his control or management."

We anticipate that this sub-section must in the near future give rise to much litigation. According to one interpretation which may be put upon it, it represents an attempt on the part of the Legislature to retain in some degree the principle that a man must not be held liable to pay compensation unless he has some measure of control over the premises where the accident took place. But a question of extreme nicety arises as to whether the meaning of the term "premises" must be limited or restricted in this way.

Our meaning can best be illustrated by a few concrete examples. In the case above suggested, where a builder employs an electrician to do the wiring, it is manifest that the principal would be liable as the accident took place on the building. In such a case it would be an easy matter to define the term "premises." But take the case of an electrical contractor who employs an experienced wireman to go round and do repairing jobs. Assume that the wireman is paid by the job, and that he is at liberty to employ an "odd man" to assist at the work. In carrying out work at a private house the odd man sustains an injury. Can he claim against the principal under the Act? He could clearly do so under Sec. 4 (1) if it were not for Sec. 4 (4). In order to justify a claim the judge would have to be satisfied (*a*) that the accident happened on premises on which the principal had undertaken to execute the work; and (*b*) that such premises were under his control or management. Now it is clear that in the case suggested the accident did happen on premises where the work was undertaken; the *crux* of the matter is—Were those premises under his control or management? If we confine the term "premises" merely to the house of a particular customer, it is obvious that the principal exercised no direct control or management; but it is more than doubtful that the Court would so restrict the meaning of the phrase. What are the "premises" on which the principal undertakes to do work? He holds himself out as willing to do repairs anywhere; and it is at least arguable to say that he, therefore, has control or management over any premises which are included in the area over which his operations extend.

It is interesting to note that this construction of the clause was recently put before a County Court judge. While he refused to accept it, it is clear that he felt some doubt; for he gave the applicant every facility to assist him in appealing. That there is something to be said in favour of this view of the clause appears from the following passage in "Willis Compensation Act, 1906," where the author says (at p. 72): "It will probably be found that a wide interpretation will be given to the word "premises," and that it will be extended to include the whole physical area of work which is undertaken. . . . It is even conceivable that an arbitrator may be supported in a finding that an accident

occurring on a mud hopper, engaged in carrying out to sea the mud dredged from a harbour, although the accident happens a long distance from the harbour itself, is within the description."

## TRAMWAY INSURANCE.

[COMMUNICATED.]

The subject of mutual tramway insurance has from time to time been seriously mooted, inasmuch as it is found that Accident Insurance Companies are apt to charge rates which depend very much on fluctuating factors, such as the number of accidents occurring on a particular line during a certain time immediately before the valuation was effected. It would seem an excellent suggestion that tramways among themselves should adopt mutual insurance, and if properly conducted the idea admits of great possibilities; it rids at one stroke the tramways of the profit-hunting insurance company promoter and lays the burden of contributing a proper quota to the insurance fund upon the right shoulders. It is therefore interesting to note that Halifax is taking the lead in this matter by suggesting that a certain number of undertakings should combine to form mutual protection on these lines.

There are many features in the tramway system peculiar to each undertaking and understood only by tramway men, and it would seem that a committee of tramway men would be the right persons to proportion equitably the premium to be paid by each undertaking. One of the principal of these features is the district through which the tramway runs; those systems which have severe gradients are much more prone to accidents than lines running over a country of a flat character. In great cities the service itself, if very frequent and running through congested areas, gives rise to a good many more accidents than would be probable in smaller towns with a large proportion of suburban traffic. Again, the class of men employed as drivers, and the wages paid them have a considerable influence upon the safety, or otherwise, of the same undertaking; good wages command good workmen, whereas a system working with badly paid men working for long hours is certain to be in trouble much oftener than an undertaking where the wages are attractive enough to keep scores of good men waiting for the posts of those discharged through inefficiency.

Again, the condition of the equipment is a further controlling factor in deciding the risk of the tramway system. Practically all the accidents occurring in recent years on tramway undertakings have been more or less connected with insufficient or improper braking, either due to mis-handling or to intrinsic defects of the apparatus. The manager who, for the sake of economy, apparent or otherwise, cuts down the repairs, overhauling and inspection of his car equipments to the uttermost farthing in order to produce a good balance-sheet, should be made to compensate for this in his insurance premium, inasmuch as many pounds paid in compensation might be saved by as many shillings spent in maintaining the system in its proper condition. It is, therefore, seen that the conditions affecting insurance are altogether too intricate and specialised to be properly handled by ordinary individuals; they should be dealt with by men who have had a thorough and well-sustained training in the subject, and who are in intimate practical touch with its requirements. These men are not to be found in ordinary insurance companies.

At the same time it must be remembered that the very success of such a scheme will constitute an economic danger to its existence. If by the devotion of highly specialised engineers a suitable and equitable system of tramway insurance is produced, it will extend its borders, and in course of time will become of such large proportions, geographically speaking, that a vast amount of time in skilled supervision will be required and the salaries and fees necessary for efficient organisation will absorb a great proportion of the income derivable from the insurance policies. The proposition, therefore, appears to limit its favourable aspects to transactions over a limited area if co-operative tramway insurance is to be economically successful, and this induces another train of reasoning.

Granted that geography plays an important part in the organisation and working expenses of insurance schemes, would it not be possible for a single municipality, or, if small, a very limited group of municipalities having thousands of pounds put into various undertakings to adopt a virtual insurance scheme of their own, to include all their various works, and to appoint a properly qualified expert as an officer of the municipality to decide the risk on different classes of the municipality's energies, and to apportion the premiums payable according to the risk. The analogy of the diversity factor of an ordinary electricity supply station may help this consideration. Supposing that every consumer on the mains of a central station required energy for a particular class of work, there would be a vast amount of load at one particular time of the day, and a correspondingly idle period at other hours. If the number of enterprises fed by the station are sufficiently diversified the load is spread more uniformly, and working expenses are reduced. Similarly, if a municipality were to combine its risks on gas, water, electricity, tramways, &c., into a central fund the diverse nature of the risk and the fact that every portion of the insurance undertaken was under the direct personal supervision of the insurance officer to the municipality would probably guarantee a lower proportion of risk, and, therefore, a lower average premium than if business were to be done in one class of risk such as tramways spread over a collection of towns. In any case, whether co-operative tramway insurance or municipal self-insurance were adopted, it would appear that the scheme would be preferable to the present ponderous charges of the insurance companies and the fictitious magnitude of the risk which they profess to take, but which, if the example of the Swindon accident is a criterion, is next to nothing.

## PUBLICITY FOR SMALL UNDERTAKINGS.

By B. N.

### Introductory.

One of the outstanding features in the Electrical Press during the past year has been the number of articles devoted to the commercial side of electricity supply; while many of these articles have been written by men who cannot possibly have had practical experience of the methods they advocate, there have been a few articles by men who knew their subject. These articles, many of them of great excellence, all have one defect, they deal only with large undertakings and entirely neglect the smaller undertakings where expensive publicity cannot be made to pay; indeed, to adopt some of the suggestions put forward by certain writers would take the entire revenue of a small central station.

Anyone who has considered the subject will readily admit the necessity for a small undertaking to secure as much business as possible; an undertaking in a large town very soon arrives at an output large enough to enable the management to generate economically, but this is not the case in a small town, so that it is even more important for the small town to secure the greatest amount of business possible in the shortest time, because every new consumer carries a greater amount of profit to the small undertaking by reason of the reduction in working expenses per unit that the extra output makes possible.

It must, however, be obvious that too high a price can be paid for new business, and there is a delicate irony in the fact that so many people who have written on the subject of the commercial development of electricity undertakings have quite failed to notice that many of the methods they advocate are commercially impossible, that is, they cost more than the profit they can possibly bring in.

It seems, therefore, that there is room for a few short articles on the various methods that have been adopted for securing new business in small towns.

The whole problem of securing new business varies so greatly with the size of the town that it must be clearly

understood that the following remarks refer only to towns of 30,000 inhabitants, or less.

Many suggestions have been put forward together with estimates of the probable results, but practically no information has been published showing the actual results of the various schemes, and it is with this phase of the subject that these articles deal.

At the very outset a difficulty of some magnitude arises due to the fact that where any experiment has turned out badly, and money has been lost, there is a natural reluctance on the part of the authorities to publish the results; to an outsider this may seem a selfish policy, but station engineers will readily agree that to allow anything of this nature to be made public would be simply looking for trouble.

If it is a municipal supply, not only will the matter be brought up in committee and in council, argued upon by men with no knowledge of the subject, and discussed in the public Press, but it will probably be used for political ends by individuals and associations, the municipal reformer will use it as an argument against his particular enemies, and probably the electrical Press will use it as one more argument against municipal trading.

If, on the other hand, the supply is provided by a company, the directors are not likely to wish to depreciate the value of the shares of the company, neither will they relish the questions and comments of the shareholders at the annual meeting; in any case, no matter who is responsible for the undertaking, to allow the public to know that errors have been made, involving considerable sums of money, is a very foolish move, because it will very probably shake the confidence of the consumers, and neutralise a great part of the work of the business management.

It will, therefore, be seen that it is not possible to publish the name of any town, and the figures obtained there, but any figures given may be relied upon as accurate even though the source must of necessity be withheld.

## Feee Wiring.

One of the oldest aids to obtaining business was the so-called "Free-wiring" system, by which the owners of the electrical undertaking put in the wires and fittings at their own expense, charging the consumer a rent for the installation.

There were two ways of collecting this rent.

By the first method the consumer was charged at a higher rate per unit than the ordinary supply price, the extra amount so obtained being the rent of the installation. It was very soon realised that this was not a satisfactory method of charging, because the long-hour consumer who used a large number of units per lamp was paying very much more rent than the short-hour user; and, as the whole policy of the central station should be to encourage the long-hour user rather than the short-hour consumer, this method of collecting the rent very quickly fell into disfavour; it is now very little used except in the special case where supply is given to artisans' dwellings through a prepayment meter. This special class of business will be dealt with later.

The second method of collecting the rent of the installation, and the one now in general use, is to charge a fixed rent per lamp installed, and to add this amount to each quarter's account.

Many small towns have done a large amount of wiring on these lines, but the result, in most cases, has been far from satisfactory when judged either from the point of view of the return on the capital invested or the increase in popularity of electric lighting.

There are several reasons for this unsatisfactory state of affairs:—

1. The expense of retaining the free-wiring consumer after he is connected up has been much higher than was expected. Free-wiring consumers are, or rather they should be, tenants and not owners of the property they occupy. After a little time the tenant may leave, and then the new tenant wants a large part of the wiring rearranged to suit his own purposes; if this is not done he does not use electric light, and the interest on the outlay is lost. If it is done, the cost of alteration has to be borne by the central station. In either case, the unfortunate manager is faced with a loss on that particular installation. Again, the new tenant may want electric light, but may not want to pay rental, or may think the rental too high; he asks the manager at what price he will sell the installation; the manager looks up the cost, and finds that the job, being done, say, four or five years ago, cost more than present-day prices. He writes off the amount set aside as depreciation, and finds he can sell the installation at, say, £20. The tenant then produces an estimate, perhaps from a firm who do not put in very good work, for, say, £15; and the manager is offered the alternative of accepting £15 for the job as it stands or seeing the tenant re-wire the place, when, of course, he has to remove his installation. He is therefore faced with a loss either of £5 or of the whole £20, for any material taken out of a wiring job will hardly pay the cost of taking down. Even if the new tenant is willing to pay the whole rental, he will certainly want new lamps—and he will get them, too, because he holds such a strong position. He can practically say to the manager, "Which do you prefer—a large loss or a small loss? Either you give me new lamps or I go back to gas lighting."

The time spent on keeping in touch with new tenants, entering into agreements with them, &c., is very considerable; and also the office expenses are higher for these people, all of which must be charged against the free-wiring rents.

2. The rent charged in nearly every case has been far too low to cover interest, depreciation and other expenses. A few years back it was not unusual to find free wiring being done at a rental of 1s. per light per annum; now, in small towns, it is not possible to get private houses wired (including lamps, shades and fittings) for much less than 20s. per light, and shops for 15s. per light. Of course, if there were a large number of houses to be wired all at one time this price could be reduced, but in small towns by far the greater part of the work is wiring one house at a time, and for this class of work the above prices should be allowed. Taking the houses, it will be seen that a rent of 1s. per lamp per annum is only 5 per cent. on the outlay, and is obviously absurd.

Five per cent. interest on the outlay is little enough, and 5 per cent. depreciation is an absolute necessity. To this must be added at least 2½ per cent. for other expenses, such as cost of repairs, alterations, new lamps, and extra office expenses as previously mentioned. This makes a total of 12½ per cent., or 2s. 6d. per lamp per annum as the lowest price at which free wiring can pay expenses. Shops could be done at a lower price, but it is questionable whether it is advisable to do so, because it will be found that shops cost more in alterations, &c., than private houses.

It is sometimes argued that the rates for free wiring should be cut as fine as possible, and any loss made good out of the additional revenue for energy, but this can only be called bad business. The rates for energy ought to be the lowest it is possible to quote, and if they are on this basis there is nothing to spare for free-wiring losses. If, on the other hand, the rates are higher than is necessary, then reduce the price of energy, and it will bring more business than any free-wiring scheme and at much less capital cost.

It is also argued that it can be stipulated in the agreement that the consumer shall pay for all lamps, alterations, &c., and, where the premises are in the hands of the original consumer, this can often be carried out; but, as most free-wired property is frequently changing hands, this stipulation is of little use. Generally speaking, it is the new tenant that gives the trouble, and as he is not bound by the original agreement, he is in such a strong position that it is nearly always necessary to give him what he wants in order to avoid the heavier loss that would ensue if he did not take up his predecesssor's installation.

Another bad feature about free wiring is that in many cases premises are free-wired where otherwise the consumer would pay for the wiring; this is largely due to the method of working the system. In many cases the supply authority pay a contractor to do the work, giving the order to the contractor who brings in the application. This tends to encourage contractors to get free wiring in place of contracts with the consumers. It is less trouble, the money is safe, and prompt payment is certain, so that a contractor may well ask himself "Why should I go to considerable trouble and spend time getting a contract from this man, when it is more to my advantage, and very much easier, to persuade him to go in for free wiring?"

Even if the supply authority do the free wiring themselves, there is always a temptation for the canvasser, assistant engineer, or whoever calls on the prospective consumer, to push free wiring, as it is undoubtedly easier to get certain classes of business on free wiring than on a contract basis.

3. The free-wiring consumer is very much inclined to add his free-wiring rental to his lighting bill, and then decide that electric light is too expensive. Many managers have come to the conclusion that the talk these people make among their friends has damaged the undertaking more than free wiring has helped it.

If the free-wiring consumer is dissatisfied, he has no hesitation in going back to gas lighting. He has incurred no outlay, and therefore does not sacrifice anything, as is the case with the man who has paid for his installation. It is quite a well-known fact among managers that by far the greater number of disconnections are among the free-wired consumers.

In spite of the many drawbacks to free wiring, there is undoubtedly a certain class of business that can be obtained in no other way, and there are few small central stations that can afford to be without a free-wiring scheme. It is an unpleasant necessity, and should be worked with great care.

It is suggested that a scheme on the following lines would enable the manager to get consumers to whom free wiring is a real benefit, and would at the same time choke off most of the people who usually make free wiring a bad speculation :—

1. The free wiring should only be given to people who are tenants with leases of three years or less. All people owning the property or having it on long lease should be refused.

2. The tenant should be bound by agreement to pay the free-wiring rent as long as he occupies the property, whether he uses electric light or discontinues its use.

3. The rental should not be less than 2s. 6d. per lamp per annum.

4. The manager should examine every free-wiring application and refuse any doubtful ones.

5. It should be explained to every free-wiring consumer that his electricity bill, plus free-wiring rental, will cost more than his gas bill.

6. The canvasser, if paid by commission, should only receive half the usual commission for free-wiring jobs.

7. Above all, it is necessary that each free-wiring consumer should clearly understand the agreement before he signs it. One man who thinks he has been trapped into an agreement he did not understand, can make an appalling amount of talk in a small town.

If free wiring is run on the above lines, it may not bring very much new business, but it will at least prevent a town of 15,000 inhabitants spending £10,000 on free wiring and getting a return of 4 per cent. to pay both interest and depreciation. This may sound impossible, but there is more than one place in England where it has happened.

(*To be continued.*)

**The Bleaching of Flour.**—In the course of an article on the chemistry of the bleaching of flour, published in the *Journal* of the American Chemical Society, Mr. S. Avery discusses the various processes that have been proposed for the purpose, and finally decides that the Alsop method has been chiefly responsible for the adoption of flour bleaching in the United States. The Alsop process has been patented (U.S. Patent 759,651, 1904), and consists in treating the flour with air which has been submitted to an electrical discharge, so that it contains nitrogen peroxide. Special experiments carried out by Mr. Avery show that the bleaching power of the following substances increases in the order given :—From chlorine, bromine, sulphurous acid, to nitrogen peroxide; and that a mixture of $NO_2$ with ozone is no more efficacious than a mixture of ozone with ordinary air. Hence only the nitrogen peroxide is the active material. The yellow colour of unbleached flour is due to the oil it contains. When extracted, the oil can be bleached by exposure to sunlight or by chemical means, nitrous acid being the most powerful reagent. Comparative examination of bleached and unbleached flour indicates that there is no appreciable chemical difference between them; only the colour of the former is paler, and it contains traces of nitrite.

## PROCEEDINGS OF INSTITUTIONS.

### Electric Power in Docks.

By C. E. TAYLOR, A.M.I.E.E.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *London, on February 20th*, 1908.)

WHERE a reliable supply can be obtained from an outside source, as in the Tyne district, it is much more advantageous to take supply from that source than to generate for such loads as are obtained in docks, where the total consumption is small and the maximum demand large. The installation cost for distribution is small compared with that for a hydraulic supply, and not so liable to failure, whilst the consumption is proportional to the work done. The efficiency of electric machinery is necessarily much higher than that of hydraulic plant for the same purpose, especially that of the older type, and the distribution is more flexible and lends itself to alterations and additions as they become requisite much more readily than its competitor. For the loading of general merchandise the high gantry crane is much used, for short-distance traction electric capstans are very much in evidence, and for coaling vessels electric cranes and hoists are used, the former where the better facilities afforded by jetties or staiths cannot be arranged. Electric power is used also for preventing the breakage of coal which takes place when run from considerable heights into the holds of vessels, and it has recently been used to obviate, in a simple and inexpensive manner, the necessity for alterations to existing staiths and jetties, which the increasing size of ships employed in the coal trade would otherwise involve.

Coal conveyors have recently been brought into use at the North-Eastern Railway Co.'s dock at Tyne Dock. The arrangement consists essentially in making the spout into an endless belt conveyor, coals being shipped at a low level, and run over the belt in the ordinary way. The belt spout can be adjusted to any angle, but the useful maximum is about 25°, and at this angle some 500

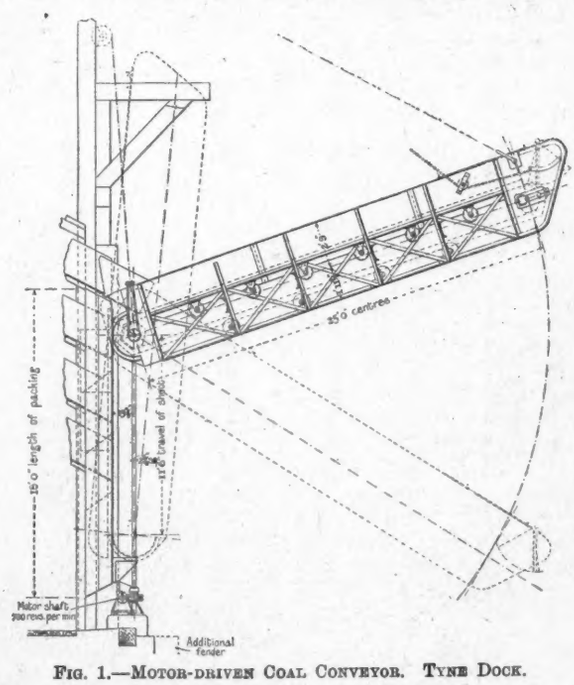



FIG. 1.—MOTOR-DRIVEN COAL CONVEYOR. TYNE DOCK.

tons can be shipped by each conveyor per hour. Practically for all angles the power remains constant at 12 H.P., and it is found that the belt automatically regulates the quantity of coal carried according to the inclination.

The arrangement is extremely efficient for the purpose for which it is intended; no other motive power could have been used in this case, and the adoption of the system has obviated the necessity for reconstruction of the staiths for a very considerable time.

The more modern staiths for shipping coal at North Blyth are very high, and coal has a long way to drop into the holds at low tide, with the result that much coal is broken.

The anti-coal-breaker arrangement, fig. 2, consists essentially of a system of buckets balanced to run over the suspended shaft, the whole being suspended from the jib of an electric crane. Coal from the ordinary spout is run into the buckets on one side of the chain, and these are carried by gravity into the hold of the vessel, where they are emptied, and the buckets begin the return movement. The speed of the bucket chain is regulated by an automatic centrifugal brake to a velocity of 120 ft. per minute.

In some cases coaling cranes are displacing hoists, or are being provided as additions. A typical example is the 25-ton crane installed on Humber Dock Quay, Hull. The lifting is done by two 50-B.H.P. motors, both coupled to the same shaft, and controlled by a series-parallel controller; the tipping motor is of 50 B.H.P., and the

slewing motor 20 H.P. Fig. 3 shows the arrangement of the ropes for lifting and tipping the wagons; the slack of the tipping rope is taken up by another barrel, which is geared to the lifting barrel, the rope being taken over a pulley which is fixed to two square-thread screws. These screws are driven by the tipping motor and draw the pulley backwards and forwards, thus effecting the tipping motion.

Cranes of the high gantry type are in use at various docks, those at Middlesbro' and Hartlepool, of the North-Eastern

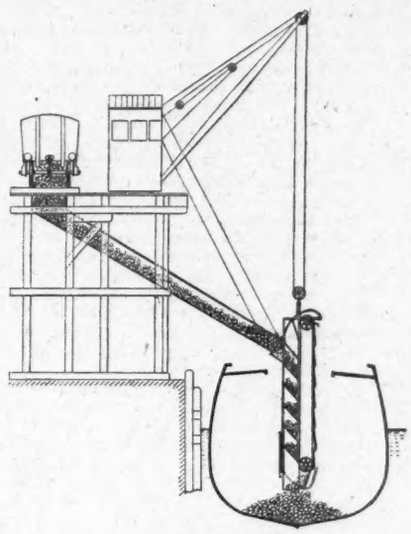


FIG. 2.—SECTIONAL VIEW OF ANTI-COAL-BREAKER, SHOWING METHOD OF OPERATION.

Railway Co., being capable of lifting 10 tons and 3 tons at 150 ft. per minute, 1½ tons at 250 ft. per minute, and slewing at 400 ft. per minute.

Current is taken from underground mains on the quay, which are connected at intervals of 50 ft. to plug boxes.

In these cranes, when lowering, the motor is driven by the weight, but a new device is now in vogue on similar cranes, patented by Messrs. Stothert & Pitt. The lifting barrel is not keyed directly to the shaft, but runs loose on it, and is connected or disconnected by a friction clutch. On moving the lifting handle forward, current is switched on to a solenoid putting the clutch into gear, and the lifting motor is started simultaneously. A large friction brake drum is keyed directly on to the lifting barrel. The lifting controller does not reverse the motor, as the lowering is carried out independently by the loose drum. The great advantage of this arrangement is the large increase in speed of working both in lifting and lowering, and also the reduced liability of accident to the motors, owing to the impossibility of suddenly stopping the armature. Lifting can be continued at full speed and the load brought to rest instantly by pulling over the handle; lowering can be commenced instantly without perceptible pause from lifting at full speed.

At Rothesay Dock a special capstan has been designed by Messrs. Baxter & Dixon, of the Clyde Navigation Trust, in which

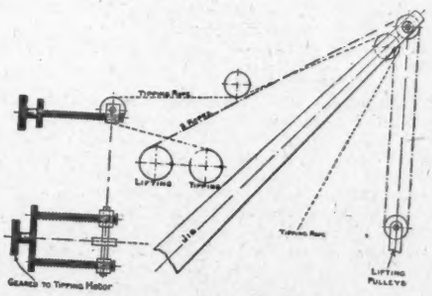



FIG. 3.—DIAGRAM SHOWING THE ARRANGEMENT OF LIFTING AND TIPPING ROPES FOR 85-TON ELECTRIC COALING CRANE.

the principal feature is a fixed rope and loose head. A wire rope is permanently fixed to the capstan head, which is made to run loose on the spindle, but when required is connected to the spindle by a clutch sliding upon the upper end of the spindle inside the head. The starting switch and clutch are controlled by a long lever which in the backward position releases the head by throwing out the clutch, and in the other direction puts in the clutch and operates the starting switch. The man is thus free to work his starting switch in an upright position and see all that is going on, as against one foot and two hands. This type of capstan is shown by fig. 4. The saving effected by electric capstans is sometimes very large.

Electric capstans can be fitted in many cases where other forms could not be used. On the North-Eastern Railway Co.'s staiths at Dunston an under-deck type of capstan, fixed entirely under the floor of the staiths, is being experimented with. In this case the capstan is not furnished with the usual head, the rope being carried round a horizontal drum. The barrel has on it a fixed rope which passes up over horizontal drums placed level with the floor of the staiths, so that the rope may work in either direction as required for hauling purposes.

The method of working is such that, when the treadle is depressed, the stator is made alive, and the motor is brought up to speed by cutting resistance out of the rotor circuit; at the same time the band brake is released, the friction clutch engages with its drum, and the rope is wound round the barrel. When the treadle is released the clutch allows the rope barrel to stop immediately, and the momentum of the motor is pulled up gradually by the band

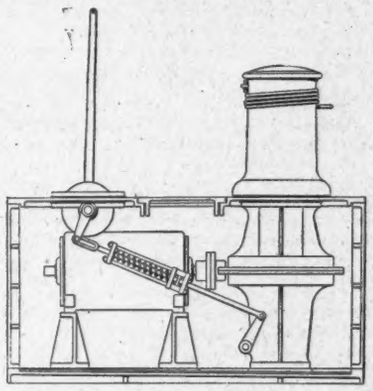


FIG. 4.—TYPE OF CAPSTAN WITH FIXED ROPE AND LOOSE HEAD.

brake. The motor is only operated in one direction, the drum running freely when slack rope is needed, which is drawn off by hand as required according to the number of wagons to be hauled.

Any new dock would probably be fitted with electrical power throughout, as at Rothesay Dock, Fishguard, &c., but it cannot be expected that the hydraulic plant in use at an old dock should be pulled out and replaced by electrically-driven machinery until it is worn out.

An improvement can, however, be made by installing electrically-driven hydraulic pumps supplied by power from a power company and working these automatically. A change of this kind is at present being made at Tyne Dock, where three engines and five boilers are being replaced by four electrically-driven pumps with three-phase motors of 132 B.H.P. each. These drive three-throw crank pumps through a flexible coupling. Each motor is provided with a three-phase automatic starting switch driven by a small motor of $\frac{1}{12}$ H.P., which is connected between two of the phases and brought into action by a switch attached to the accumulator.

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## The Electric Driving of Heavy Rolling Mills.

By G. J. HOOGHWINKEL, M.I.E.E.

(*Abstract of Paper read before the* SHEFFIELD SOCIETY OF ENGINEERS AND METALLURGISTS, *January 27th*, 1908.)

THE author dealt with three-high and reversing mills of the heaviest type, considering that the small mills were best driven by electric motors without equalising sets. At least six mills of the former types, with electric motors up to 10,000 H.P. each, are already at work. First, the author briefly referred to steam and gas-driven mills, remarking with regard to the former that though the engines were economical when running at full load, the rolling period was only 8 or 10 per cent. of the total time of running, while with gas the plant cost 50 per cent. more than with steam. Taking coal at 10s. or 12s. per ton, the value of the gas was about ⅔d. per 1,000 cb. ft., and the fuel costs of the gas engine drive were less than with steam. The gas engine, however, had not been successful for heavy rolling-mill work.

The author then enumerated the advantages of the electric drive, and the disadvantages alleged to attach to it. Chief amongst the former were the concentration of the power plant, the reduced labour and fuel costs, ease of fitting and handling, and accurate control of the energy used, enabling defects in running to be detected at once.

Intermittent drives were, he said, favourable to the use of electricity, as well as continuous drives. It was probable that large private power stations would be able to generate at lower rates than those charged by the power companies. The cost of production with blast-furnace gas, though less than with coal, was not as low as was generally alleged, owing to the higher capital charges and cost of maintenance. In some of the South German stations the generating costs with gas were 0·25d.; and with coal at 6s., he had obtained 0·3d. per unit at a large colliery power station with a

40 per cent. load factor. It was better to reckon with coal at 12s. per ton, and to value the gas at ¼d. per 1,000 cb. ft. In many cases the author favoured gas-driven blowers and steam-driven electrical plant with gas-fired boilers.

In a combined blast-furnace and steel works, the daily load factor was over 60 per cent.; in rolling-mill works 40 per cent. was the average.

The cost of steam-turbine plant, with coal-fired boilers, including 25 per cent. spare plant, for a net output without the spare of 5,000 H.P., was £60,000, and the running costs, with an output of 18 million units on a 60 per cent. load factor, were 0·35d., taking coal at 12s. per ton, and allowing 12 per cent. for capital charges and maintenance. With gas-fired boilers, taking 450 cb. ft. per unit generated, the capital cost, including cleaning plant, would be the same, and the total generating costs would be 0·16d.

In the case of gas power, the capacity of the plant had to be increased by 40 per cent. on account of the lower output of the gas engine in comparison with the turbine of the same rated load; a station of 7,000 H.P. maximum capacity would cost £90,000, and the total generating cost per unit would be 0·2d. Thus for medium-sized steel works, power could be obtained at from ·35d. to 0·12d. per unit, with 0·2d. as a fair average.

For driving rolling-mills, variable speed is necessary, to suit the material rolled, and to benefit by fly-wheel effect a fall in speed is required. This can be obtained by a compound winding in the case of D C machines, or by inserting resistance in the rotor circuit when three-phase motors are used. High-speed motors coupled to heavy fly-wheels, with rope drive, are best for plate mills of 1,000 H.P., the motors running at 200 R.P.M. The author is installing in a South Wales colliery a winding plant with an equalising fly-wheel set, of which particulars will shortly be available. For continuous mills separate fly-wheel sets are not usually required.

Rolling-mill motors must have reasonable clearance and substantial bearings. For continuous mills the motors are usually of about 500-1,000 H.P., but plate mills require motors of much larger output, and heavy bar mills from 2,500 to 5,000 H P. Most modern mills are driven by high-pressure three-phase motors. In Europe alone some 230 motors are installed for medium and heavy mill work, of 190,000 H.P., with a maximum output of 410,000 H.P.

For reversing-mills gas power is out of the question. Quick starting and stopping are essential, and therefore the inertia of the revolving masses must be kept down. Full speed must be attained in two or three seconds. At the Illinois Steel Works, a 30-in. two-high mill is driven by two 2,000-H.P. motors at 0-150 R.P.M., reversing every four seconds; the average station load is only 30 per cent. of the maximum load of the motors. In most cases an equalising system is required to regulate the output of the generators. The cost of the electrical plant is equal to that of steam. For an output of 300,000 tons per year from 2½-ton blooms, the average load on the mill shaft is 435 H.P., and the motor driving the fly-wheel set takes 800 KW., while the power station must provide 1,100 KW. The generating costs will be 0·45d. per unit inclusive, and the output 2,300,000 units per annum, costing £4,000. The cost with steam would be £7,000 or £8,000, so that electrical driving gives a saving of about £3,000 a year.

### Discussion.

Mr. W. F. Beardshaw, President of the Sheffield Society of Engineers and Metallurgists, opened the discussion, remarking that the lecturer's costs were based simply on steam power generated from boilers, and he would like to hear the comparison when generating steam from the waste heat reheating furnaces, as he thought that would make a considerable difference in the cost.

Mr. S. Eckman said that under the heading of "gas engine drive" the value of blast-furnace gas was given as ·75d. per 1,000 cb. ft. as against ·25d. as proposed from other sides, and he believed that the value of ·75d. with the present coal prices was still too low. But the gas should be burnt in a gas engine and not under a boiler, and not the steam generated but the H.P.-hours or units generated should be compared. If the conservative figure of 120 cb. ft. of gas per B.H.P. were used, 1,000 cb. ft. of gas would generate 8·4 B.H.P.-hours. If it were further assumed that 15 lb. of steam were required for 1 B.H.P.-hour and that 7 lb. of steam required 1 lb. of coal, it worked out that 18 lb. of coal were necessary for generating the same number of B.H.P.-hours as 1,000 cb. ft. of gas, or, expressed in money, 1,000 cb. ft. of gas had a value of 1·16d. if the value of coal was 12s. per ton. Generally, one could say that the value of 1,000 cb. ft. of gas in pence was equal to the price of coal in shillings per ton divided by 10. Great importance must be attached to the accuracy with which the power consumption for each class of work could be measured by means of electric instruments. This accuracy would lead to close prices for the goods manufactured, and, therefore, facilitate competition. The instruments also showed any defects either in the rolling process or the mechanical part of the mill.

Mr. J. S. Peck gave an instance of a saw driven by a variable speed motor; the user experimented with different materials until he found the proper speed for each, which gave the maximum rate of cutting, and the minimum wear on the saw, while requiring a minimum amount of power, and any deviation from that speed meant a great loss in economy. In driving three-high mills, it was necessary, in order to get the advantage of the fly-wheel effect, that it be slowed down. In the case of a reversing mill, they must reduce the rotating parts to a minimum, yet with the load equaliser they were enabled to use a large fly-wheel, and slow it down at will. They had manufactured a number of motors for driving three-high mills, but after they were installed and working satisfactorily, the mill manager said that the Germans were the only people who knew anything about driving these mills. They adopted the tactics of the Germans by going over there and getting hold of their methods, and after a great deal of experience in the designing of these machines, he could say that it was now not necessary to leave this country for electrical plant.

Mr. S. E. Fedden said the Sheffield manufacturers already had a few of the small mills directly connected by means of electric motors, with satisfactory results, and he thought that a number of other manufacturers were only waiting for their steam engines to break down to come on to the Corporation for the electric power. With reference to the centralisation of power, it might pay any large steel works with 500 to 800 H.P. to put down a power house and pay a first-class engineer to look after it, and thus save a considerable amount of money. Steel works managers were hardly experts in electric power production. He had had an opportunity of looking round a good many large gas-driven works on the Continent last autumn, and he was struck by the enormous amount of labour employed. In a certain city where they had 2,500-H.P. gas engines, he noticed seven men with buckets of oil continually going round an engine, and in addition there was a foreman in charge of each gang. The author pointed out the great advantage of electricity as a means of measuring the power consumed; he mentioned one instance of a small works which called for a 10-H.P. motor, as the steam engine previously used was supposed to be 10-H.P. They soon complained, after the motor was installed, that it was running hot, and it was found to be doing about 14 H.P. In Sheffield they already had some 9,000 H.P. connected to the mains, and their diversity factor was such that the maximum load on the generating plant seldom got above 4,000 H.P. If each of these works had to put down their own plant, their capital charges would be a great deal heavier, because they would have to provide spare plant in their works if they wanted reliability of supply and against repairs and because their individual diversity factor would be considerably less. The author had only allowed £24,000 for the capital cost of a 1,500-KW. plant plus 50 per cent. He could not put down a station at anything like that figure. The best load factor he had got, on large works taking some millions of units per annum, was only 18 per cent., and as the author's actual generated cost, taking into account the distribution with a load factor of 40 per cent., was ·5d. per unit, he thought the price at which the corporation supplied power—viz., ·61. with a load factor of 18 per cent., was something to be congratulated upon. A high-tension motor was no more dangerous than a transformer in one's house, as if anything went wrong the circuit-breaker would come out and disconnect it. High-tension motors were smaller and often cheaper than low tension, and large supplies taken at high tension saved money in cables to the user and supplier alike. A rolling-mill motor should be very substantially built, and would cost more than an ordinary motor of the same nominal capacity. The bearings were heavier and the clearances greater, in order that the motor should stand more rough usage. He would like to ask the author if rolling rails by the electric motor got over the trouble of corrugation.

Mr. Gerald J. Hooghwinkel, in reply, said he had tried to keep the figures on a modest basis. The station load factor in several modern steel works, as mentioned in the paper, was actually 40 per cent. In all the mills where the Ilgner system had been installed, practically a continuous straight line was obtained in the power station, showing that these electrical reversing mills gave a good load factor at the station, although their individual yearly load factor was not more than 8 per cent. In one colliery they got 49 per cent. load factor due to the power consumption of the electrical winding engine being constant at the station. In Germany he had known actual works costs of ·25d., including all capital charges. The enormous output, reaching something like 14,000,000 units, largely accounted for the very low figures. In some of these gas-driven stations the full works cost, including all capital charges, was ·2d. He did not think that they would get these figures in Sheffield, although there were a number of large steel works there. He thought that high-tension motors were much safer, and that high-tension switchgear, with oil switches and everything completely enclosed, was much more satisfactory than low tension. In a colliery in North Wales, where two small high-tension cables at 2,200 volts were sufficient to supply about 1,000 H.P. for pumps underground, he advised them to put down these cables. The makers of the turbines were rather anxious to supply low-tension dynamos, with the result that the shaft had about eight low-tension cables 3 or 4 in. thick—and the people imagined that this was safer. He was of opinion that the more cables and the heavier they were, the more dangerous it was, whether they were low or high tension. He had no doubt that electrically-driven rolling mills would produce a more evenly rolled material for rails.

## Advantages and Disadvantages of Superheating.

Discussing superheat before the Manchester Association of Engineers on January 25th, Mr. M. Longridge first drew attention to its mechanical disadvantages. He passed over the independently fired apparatus with a few remarks of praise only, for he had had little experience of this type, and heard only good of its qualities. He referred to nickel alloy and nickel steel as material for the seats and spindles of valves using superheated steam. Corliss valves were named as capable of use up to 500° F.—a temperature which appears to be one generally accepted for the maximum for these valves by most superheat men.

Piston and double-beat valves would work at all ordinary superheat temperatures, but there was liability of pistons seizing not only because of want of oil, but also because of the distortion of the cylinder from unequal expansion, and it was recommended that pistons should have greater clearances to admit of superheat being employed. Much, of course, may be done to

design cylinders so as to be distorted as little as possible, much as turbine casings may be designed. Very much of the cylinder distortion in any class of engine is due to rigid bolting down at long bolt centres.

As regards cost of superheat, this is divisible into two heads—first, the fuel cost of superheating, and secondly the cost of the plant and its regular maintenance. The coefficient of specific heat of superheated steam was taken as 0·5, and on this basis the heat necessary to give 200° F. of superheat would be 8·9 per cent. He would like to place a superheater after the economiser, but such a position involved much too great an area of superheating surface, for the waste gases had but little heat energy remaining.

To get a steam temperature of 500° to 600° F., the gases must have a temperature of 1,000° to 1,200° F., and in the back downtake of a Lancashire boiler the temperature varied from 900° F. to 1,300° F. At a pressure of 150 lb. a superheat equivalent of 945,000 units could be got for 480,000 B TH.U., or 5 per cent. of the total heat entering the boiler. A surface of 300 sq. ft. would be necessary, at a cost of £180, and the total cost of 250° of superheat, including maintenance and the 5 per cent. actual fuel or heat cost, would be 8 per cent. of the working costs. But this cost, as Mr. Longridge seemed clearly to perceive, may be more or less illusory. To cure very wet steam and prevent excessive further loss in cylinder action that wet steam brings about, may easily be worth more than the 5 per cent. of heat filched from the boiler for superheat. And often a hard-worked fireman has his work rendered easy and his efficiency improved by the benefit of superheat, so that it really is very difficult properly to apportion the proper share of gain due to each effect of superheat. The "missing quantity" was referred to as largely curable by superheat, and the author properly drew special attention to the comparatively small transfer of heat between hot dry steam and dry hot surfaces as against wet steam and dewy surfaces. Almost could adiabatic expansion be secured if steam could be worked dry throughout the stroke, an impracticable matter, however, with ordinarily permissible superheat temperatures.

Certain French statistics were put forward showing 10 per cent. economy of steam and 11 per cent. of fuel with simple engines, and 23 per cent. of steam with 21 per cent. of coal for compound engines. These figures do not differ much from English figures as obtained in textile factories, and the author considered that, in face of all the facts, the economy of superheat could not be denied. Steam men know what can be done, and every case must usually be taken on its own merits. Possibly Mr. Longridge is too hopeful when he suggests the possibility of calculating the economy of superheat by means of a formula yet to be constructed from all the involved quantities of speed, pressure, temperature expansion, cylinder surface, weight of steam and any other factor that goes to influence cylinder condensation. Surely "it were to consider too curiously to consider so." Nothing appears to have been put forward on the important subject of temperature control. When the downtake temperature of the Lancashire boiler may vary from 900° to 1,300°, some method of control seems inevitable. Without control either by mass inertia of metal cores or outside disks or of water, the superheater must be proportioned so that its maximum superheat addition is under the safe temperature limit, and the minimum must be so low that the mean superheat is comparatively small. This halting procedure greatly detracts from the benefit possible with superheat, and it would be interesting, and a useful addition to our steam knowledge, if an engineer of Mr. Longridge's standing and opportunities would give his serious attention to this important part of the art of superheating and generally to the question of frictional heat gathering by dry steam, and the whole subject of diathermancy, on which so much depends. Certain it is that the whole art of superheating from first to last requires to be accorded as much care and study as does steam engineering generally, for in superheating there are gas temperatures on one side of a steel pipe which will produce undesirable temperatures in the metal of the pipe, and there is no sufficient heat absorbing quality in dry steam on the opposite face of that pipe to countervail this effect. Thus superheating differs essentially from water heating, for no steel plate can practically be overheated from one side if its other face is kept in contact with clean water.

## Notes on Foundry Work.

A RECENT paper before the AMERICAN SOCIETY OF MECHANICAL ENGINEERS gives some of the requisites in iron for different classes of castings.

For compresser cylinders, high pressure and similar work, the chemical composition demanded is Si, 1·20 to 1·50 per cent.; S, under 0·09; P, 0·35 to 0·60; Mn, 0·50 to 0·80. Physical properties: bar 1 in. × 1 in. × 12 in. long to stand 2,400 to 2,600 lb. transverse load; to have a tenacity of 22,000 to 25,000 lb., a shrinkage in yokes of 0·160 in., and a chill in yokes of 0·25 in. For this iron 10 to 25 per cent. of scrap steel may be added in the cupola. In a foundry running both air furnaces and cupolas for castings over 15 tons one half iron from each may be mixed in the ladle to give strength. If the steel scrap exceeds 10 per cent. a very small quantity of aluminium in the ladle will give fluidity, remove gases, prevent blow holes, and give a close grain. A bit of wire 1 in. long and ⅛ in. diameter per 100 lb. of iron is sufficient. So-called casting aluminium should not be used. Large castings as hard as will allow of machining are kept sound internally by low silicon. A close grain in pig accompanies high sulphur contents due to a cold furnace, but charcoal pig gives a close grain with low sulphur. It is safer to use close-grained pig and steel scrap than scrap iron, which is to be used sparingly for strong castings. It is advised to close the grain by using 100 lb. of cast-iron borings to the ton of mixture. They are packed solid in a wooden box 6 in. deep. This gets down to the melting zone before the wood burns, and the borings melt and mix with not over 10 per cent. loss. Steel borings and chips may be used, but aluminium is then needed in the ladle. Steel and cast-iron borings must not be mixed in the same box. The scrap should be assumed to possess 1·50 per cent. of silicon and 0·10 of sulphur.

## Physical Society.

AT the annual general meeting held on February 14th, 1908, the reports of the Council and the treasurer were submitted.

There are now 437 ordinary fellows on the roll, an increase of 11, and the position of the Society shows a decided improvement. The balance in bank has increased by nearly £240. There are no outstanding liabilities, and the income shows a healthy tendency to exceed the expenditure.

The reports were adopted.

The following officers and Council were elected for the ensuing year:—

*President*—C. Chree, Sc.D, F.R.S.

*Vice-Presidents*—Those who have filled the office of President together with W. Duddell, F.R.S.; H. M. Elder, M.A.; Prof. J. A. Ewing, F.R.S.; and W. Watson, D.Sc., F.R.S.

*Secretaries*—W. R. Cooper, M.A., and Prof. W. Cassie, M.A.

*Foreign Secretary*—Prof. S. P. Thompson, D.Sc., F.R.S.

*Treasurer*—Prof. H. L. Callendar, M.A., F.R.S.

*Librarian*—W. Watson, D.Sc., F.R.S.

*Other Members of Council*—A. Campbell, B.A.; W. H. Eccles, D.Sc.; A. Griffiths, D.Sc.; J. A. Harker, D.Sc.; Prof. C. H. Lees, D.Sc., F.R.S.; T. Mather, F.R.S.; A. Russell, M.A.; S. Skinner, M.A.; S. W. J. Smith, M.A.; Prof. L. R. Wilberforce, M.A.

DR. CHREE then took the chair and delivered an address, referring at some length to the loss of Lord Kelvin, one of the earliest Presidents of the Society.

Drawing attention to a resolution of the Council inviting readers of papers and others to be considerate in their demands on time when addressing the Society, the speaker expressed a hope that fellows would not be found lacking in reasonableness. When several papers were down for reading, it was clearly impossible for all the authors to go into minute details without exhausting the patience of the meeting. In general, what was most appropriate was a summary intelligible to those who were not specialists in the particular subject of the paper.

Dr. Chree then proceeded to refer to the magnetic results obtained by the National Antarctic Expedition of 1901-4. Comparing slides of actual records taken at Kew and in the Antarctic, the speaker dwelt on the relatively highly disturbed nature of the latter, where the declination and horizontal force magnets were practically never at rest.

## Portable Wireless Stations for Military Purposes.

—During his recent visit to German East Africa, Herr Dernberg, Secretary of State, came to the conclusion that in consequence of its cheapness as compared with landlines through an impracticable country, wireless telegraphy comes first into consideration for such districts. As the capital required for the employment of wireless telegraphy in the colonies bears no relation to that needed for railways and cables, it is expected that a German undertaking will be found in the near future to deal with the question. The first point would be the connecting together of the important places in the individual colonies, and secondly, the establishment of intercommunication between the colonies themselves. After the recent performance between the Nauen station and Teneriffe, it is claimed that the bridging over of a distance of 2,480 miles could be effected with moderate funds, but the principal task is the institution of a direct connection between Germany and her colonies. During the late campaign in South-West Africa, experience with the military stations used showed that wireless telegraphy was absolutely necessary as a means of transmitting information, and it is considered that the success eventually attained could scarcely have been accomplished without the system. At the end of 1903 six stations were in operation, the principal one being at Keetmannhoop, and the remainder in a radius of from 93 to 124 miles. The main difficulties encountered in connection with the stations, which were originally constructed for German conditions, were in the provision of hydrogen for the balloon which supported the aerial wires, and the supply of benzine needed for driving the motor. The station itself was arranged on a tolerably heavy wagon, and it had, therefore, to overcome the greatest difficulties in penetrating the underwood, and in actions in the mountains. These obstacles have given the incentive to the perfecting of military stations in Germany, and rendered necessary the construction of specially light, portable stations, in which working materials, such as benzine, lubricating oil, &c., are no longer requisite. A station of this kind, which has just been inspected by the Secretary of State, consists of a transmitting and receiving apparatus, a light metallic mast, and a bicycle under-frame for driving the generator, the total weight being 4 cwt. The whole station can be divided into four loads for horses or mules, or into eight loads for men. It is stated that the range of the station amounts to 62 miles, and it can be erected in a quarter of an hour.

## NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool, to whom all inquiries should be addressed.

2,893. "Improvements relating to electric detonator fuses." The Thames Ammunition Works, Ltd., and H. G. Ticehurst. February 10th.

2,895. "Improvement in secondary batteries." L. Fiedler. February 10th.

2,901. "Improvements in electrical fuse-boxes." E. J. Selby. February 10th.

2,904. "Improvements in continuous-current machines." J. Wagner. February 10th.

2,910. "Improvements in the apparatus for testing and checking the correct or incorrect working of the electric ignition device used in connection with internal combustion engines." T. H. Schultess-Young. February 10th.

2,923. "Improvement in and relating to coherers for wireless telegraphy and telephony." H. Knudsen. February 10th.

2,926. "Revolving coherer for every kind of wireless transmission." F. von Madaler. February 10th.

2,927. "Improvements in luminous electric heaters." W. F. Howard and A. B. Cousins. February 10th.

2,938. "Improvements in apparatus for telegraphing or signalling by means of artificial light." W. Smithers. February 10th.

2,955. "Improvements in or relating to wireless signalling." R. A. Fessenden. (Date applied for under Sec. 91 of the Act, February 11th, 1907, being date of application in United States.) February 10th. (Complete.)

2,968. "Improvements relating to wireless telegraphy and telephony." C. H. Demuth. February 10th.

3,049. "Improvements relating to electric connections." H. D. B. How and W. W. Partington. February 11th.

3,056. "Improvements in relays." J. B. Struble. (Date applied for under Sec. 91 of the Act, February 18th, 1907, being date of application in United States.) February 11th. (Complete.)

3,063. "Improvements in and relating to electric motors and the control thereof, more especially applicable to motors for driving locomotive vehicles." E. de Valio and R. C. Baker. February 11th.

3,069. "Improvements in insulators for electrical conductors." Siemens Bros. & Co., Ltd., and W. Dieselhorst. February 11th.

3,076. "Improvements in and relating to incandescent electric lamps." J. A. Leon. February 11th.

3,096. "Improvements in and relating to the control of alternative electric current motors of the commutator type in their application to the driving of machine tools and other similar drives." British Thomson-Houston Co., Ltd. (Allgemeine-Electricitäts Ges., Germany.) February 11th. (Complete.)

3,109. "Improvements in quadruplex telegraph arrangements." J. P. Gorton. February 12th.

3,130. "Improved type of starter, rheostat or controller for electric motors." N. R. Booth. February 12th.

3,141. "New or improved electrical water gauge." J. A. Hartwell and H. E. Hartwell. February 12th.

3,154. "Improvements in and relating to electrical signal apparatus with wireless transmission." A. Mund. February 12th.

3,159. "Link-suspension device for incandescent bodies." F. Frey. (Date applied for under Sec. 91 of the Act, February 20th, 1907, being date of application in Germany.) February 12th. (Complete.)

3,160. "Improvements in cathodes for use in the electro-deposition of iron and other metals." S. O. Cowper-Coles. February 12th.

3,200. "Illuminated electric 'night and day' sign." J. H. Evans. February 13th.

3,248. "Improvements in or relating to supports for filaments in electric incandescent lamps." H. Hoge and The "Z" Electric Lamp Manufacturing Co., Ltd. February 13th.

3,250. "Improvements in or relating to electrically-heated apparatus particularly applicable to vulcanising apparatus for tire-tubes and covers." W. H. Welch and Harvey Frost & Co., Ltd. February 13th.

3,266. "Improvements in electric arc lamps." Johnson & Phillips, Ltd., and S. Paterson. February 13th.

3,276. "Improvements relating to the mouth and ear pieces of telephones, speaking tubes and the like." G. Sculthorp. February 13th.

3,282. "Improved automatic electric switch device." W. S. Hough, Jun. February 13th.

3,283. "Improvements in electrodes for electric arc lamps." Allgemeine Elektricitats Ges. (Date applied for under Section 91 of the Act, February 16th, 1907, being date of application in Germany.) February 13th. (Complete.)

3,284. "Improvements in and relating to electrical power transmission systems." British Thomson-Houston Co., Ltd., T. E. Robertson and F. Holden. February 13th. (Complete.)

3,295. "Device for producing or generating varying electric currents of high frequency." E. C. R. Marks. (J. A. Johnsen, Denmark.) February 13th.

3,331. "Improvements in or relating to the trolley-poles of electrically-driven tramcars and other vehicles." W. G. Whitfield. February 14th.

3,347. "Electro-dynamic controller." A. Fischer. February 14th.

3,369. "Improvements in or relating to means for indicating or detecting the existence of high voltage to which a body may be electrically raised." W. M. Thornton, H. W. Clothier and A. Reyrolle & Co. February 14th.

3,388. "Improvements in and relating to incandescent electric lamps." J. W. Howell. (Date applied for under Sec. 91 of the Act, August 7th, 1907, being date of application in United States.) February 14th. (Complete.)

3,391. "Improvements in variable speed dynamos." H. Leitner. February 14th.

3,436. "Improved contact-maker for internal combustion engines and the like." Autocars and Accessories, Ltd., and J. Weller. February 15th.

3,447. "Improvements in apparatus for the production and application of electrical oscillations." W. J. Ricketts. February 15th.

3,464. "Electric arc lamps." L. S. Andersson. (Date applied for under Section 91 of the Act, February 18th, 1907, being date of application in Sweden.) February 15th. (Complete.)

3,465. "Carbon holder for electric arc lamps." L. S. Andersson. (Date applied for under Section 91 of the Act, February 18th, 1907, being date of application in Sweden.) February 15th. (Complete.)

3,494. "Improvements in electrical apparatus for igniting the charge in explosion motors and for starting such motors." P. Marchal. February 15th.

3,504. "Process for the precipitation of electrolytic copper in the form of sheets or cylinders by iron or other metals." M. J. L. Wenger. (Date applied for under Section 91 of the Act, September 9th, 1907, being date of application in France.) February 15th. (Complete.)

3,505. "Improved current collector for electrically propelled vehicles." G. Mertens. (Date applied for under Section 91 of the Act, February 16th, 1907, being date of application in Germany.) February 15th. (Complete.)

3,507. "Improved vacuum drying apparatus for electric cables." E. Passburg. February 15th. (Complete.)

## PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool; price, post free, 9d. (in stamps).

### 1906.

Electrolytic Cells. H. S. Hatfield. 22,920. October 17th.

Dynamo-Electric Machines for Maintaining a Constant or Practically Constant Electromotive Force Under Variations of Speed, Specially Applicable to Train Lighting. M. W. W. Mackie. 23,016. October 17th.

Magnetic Compasses. A. F. Smith. 24,084. October 29th.

Mechanical Ears for Carrying Overhead Transmission Cables for Electrical Traction Purposes. H. Oliver. 28,724. December 17th.

### 1907.

Treatment of Boron. British Thomson-Houston Co. (General Electric Co., United States.) 1,197. January 17th.

Manufacture of Electrical Accumulators. E. M. Miura. 1,264. January 17th.

Devices for Regulating Pressure of Alternating-Current Generators. Ganz & Co. Eisengiesserei und Maschinenfabriks Akt.-Ges. 1,356. January 18th. (Date applied for under International Convention, January 19th, 1906.)

Control of Induction Motors. M. Milch. 1,457. January 19th.

Construction of Choking Coils for Alternating-Current Testing. R. K. Morcom and J. M. Walshe. 1,517. January 21st.

Appliances for Use in Shooting by Night. C. A. C. Batten. 1,545. January 21st.

Electric Fusible Cut-Outs. A. Eckstein and A. C. Heap. 1,713. January 23rd.

Radio-Telegraphy. E. Raymond-Barker and Amalgamated Radio-Telegraph Co. 1,759. January 23rd.

Magnetic Clutches. H. W. Ravenshaw, V. G. Middleton and W. E. Townsend. 1,781. January 23rd.

Brush-Holders for Dynamo-Electric Machines. British Thomson-Houston Co. (General Electric Co., United States.) 2,188. January 28th.

Electric Ignition Switches. J. H. Chambers and P. F. B. Bennett. 2,417A. January 31st. (Date applied for under Rule 18, January 31st, 1907.)

Dynamo-Electric Machines. M. Walker. 2,459. January 31st.

Safety Terminals for Electric Accumulators and other Appliances for Use in Mines or Otherwise. J. C. Best. 2,815. February 5th.

Apparatus for Making and Breaking the Current on Electrically-Fired Internal Explosion Engines and the like. J. H. Chambers and P. F. B. Bennett. 2,937. February 6th.

Time Switches for Electric Circuits, and more Particularly for Use with Electric Lights. R. F. Venner and R. C. Griesbach. 3,254. February 9th.

Ignition Coils of Automobiles and the like. Electric Ignition Co. and F. H. Hall. 3,483. February 12th.

Electrical Heating Apparatus. A. Reynolds. 3,915. February 16th.

Protective Devices for Electric Circuits. British Thomson-Houston Co. (General Electric Co., United States.) 4,182. February 20th.

Secondary Batteries. E. L. Oppermann. 4,574. February 25th.

Electric Rock Drills and the like. Allgemeine Elektricitäts Ges. 4,738. February 26th. (Date applied for under International Convention, February 27th, 1906.)

Electric Couplings or Connections. T. G. Hann, A. E. Ingle and Drake and Gorham, Ltd. 5,066. March 2nd.

Means for Automatically Adjusting the Commutators in Internal Combustion Engines. W. G. Royal-Dawson. 5,219. March 4th.

Method of Producing Undamped Electrical Oscillations. S. Eisenstein. 5,334. March 5th.

Manufacture of Electric Conductors Suitable for Use as Incandescing Bodies in Electric Lamps. British Thomson-Houston Co. (General Electric Co., United States.) 5,575. March 7th.

Overhead Conductors for Electric Tramways and the like. C. E. S. Bill. 6,057. March 13th.

Systems of Electrical Distribution Employing Vapour Rectifying Devices. British Thomson-Houston Co. (General Electric Co., United States.) 6,242. March 14th.

Dynamo-Electric Machines or Motors. Siemens Bros. Dynamo Works and J. C. Wilson. 6,716. March 20th.

Electric Telegraphy. Siemens & Halske Akt.-Ges. 6,929. March 22nd. (Date applied for under International Convention, March 22nd, 1906.)

Incandescent Vapour Lamps. C. A. Black and W. Thompson. 7,726. April 2nd.

Duplexing Telegraph Lines. I. Kitsee. 7,785. April 3rd.

Sockets or Holders for Incandescent Electric Lamps. R. J. B. M. Damseaux. 8,240. April 9th.

**The Action of Acid on Celluloid.**—In the course of some experiments on old accumulators in celluloid vessels, Dr. F. Schoenbeck noticed that the lead connections between the separate corresponding plates showed signs of disintegration as if they had been subjected to the action of some lead-reducing agent. Analysis of the acid showed that appreciable quantities of nitric acid were present. This was proved not only by the characteristic red colour produced with the Brucin reaction, but also by the iron sulphate and concentrated sulphuric acid test, and by reducing with zinc and testing with iodised starch. Neglecting the possibility of original impurity in the sulphuric acid used, which was practically out of the question in this case, the presence of the nitric acid can only be accounted for either by impurities in the paste used for the plates, or by a slow reaction between the accumulator acid and the celluloid case—celluloid, as is well known, being a mixture of nitrocellulose and camphor. In the present case the first explanation did not apply, so experiments were carried out in the second direction. Celluloid shavings and unimpeachable accumulator acid were put into a bottle and left sealed for several months—the contents being repeatedly shaken up. On testing the acid after this period, the presence of nitric acid was distinctly shown. Tests with celluloid from different makers showed that some were decidedly less affected than others. In view of the interest of the subject to accumulator makers, quantitative tests are to be made.—*Rundschau für Electrotechnik und Maschinenbau.*